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THINGS TO DO WITH YOUR TRS-80® MODEL 100 COMPUTER

JERRY WILLIS, MERL MILLER,
& CLEBORNE D. MADDUX

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THINGS TO DO WITH YOUR TI-99/4A COMPUTER

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THINGS TO DO WITH YOUR TRS-80® MODEL 100 COMPUTER

by

Jerry Willis

Merl Miller

Cleborne D. Maddux

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Contents

CHAPTER ONE

Introducing the TRS-80 Model 100

This book was written for people who own or are considering the purchase of a TRS-80 Model 100 by Radio Shack. Much of the material is also relevant to the NEC PC-8201 computer, which bears a striking resemblance to the Model 100. Both were designed by a Japanese computer design company that does not distribute products under its own name in the United States.

This book shows you what can be done with a portable personal computer like the Model 100 and gives detailed information on many of the programs that run on TRS-80 Model 100 computers.

When Radio Shack announced the Model 100 early in 1983, it attracted more attention from the media than any computer Radio Shack had ever produced. For a while the computer seemed destined to show up on the cover of every magazine even remotely associated with personal computing. The attention was justified. This very well-designed computer fits into a niche in the market that had been poorly served until the Model 100 came along.

Before the Model 100, most of the small portable computers fell into one of two categories. There were the rather large portable systems, such as the Osborne, Kaypro, and COMPAQ computers, that had handles but were certainly not easy to carry. They had regular-size keyboards and normal video displays, but most required regular 115-volt power to operate for any length of time. The other type was the handheld portable. These machines fit in your coat pocket and ran for hours, even

days, on tiny hearing aid-style batteries. The handhelds, like Radio Shack's and Sharpe's pocket computer models, have tiny keyboards that look as if they belong on muscle-bound calculators. Their displays are generally the liquid crystal type that accommodates no more than one or two lines of less than thirty characters. Before the Model 100, you could get regular-size keyboards and large-capacity displays, or you could get easy-to-transport machines that ran for a long time on batteries. You couldn't get a computer with a regular keyboard, a display that shows you several lines of text at once, and long-life battery power in a computer that fits in your briefcase. The Epson HX-20 computer came close, but its display is small, four lines of twenty characters, which is not enough for applications like word processing. The Model 100 is one machine that meets all these criteria. It has a regular-size keyboard, a rather large display for a lap-size computer, and it runs for twenty hours on AA size penlite batteries (an AC adapter is an option). All that in a four-pound package that fits in your briefcase with room for a couple of magazines and a sandwich.

Figure 1.1 An Osborne computer with a normal video display

Figure 1.2 TRS-80 Model 100 computer

There will undoubtedly be other computers that follow the trail blazed by Radio Shack, but when this book was written, the Model 100 was unique—no other computer offered these features.

If you need portable computing power that can be used anywhere, anytime, the Model 100 offers more computing in a small package than anything else you can buy. Outside salespeople, reporters, construction engineers, executives who do business in several cities, real estate agents, physicians who make rounds at hospitals, coaches, and teachers are only a few of the people who can use a portable computer.

This book explains what can be done with the Model 100. If you are not yet a computer owner, this book may also help you decide if you really want to buy one. This is one in a series on popular computer models. If you are shopping for a computer, you may want to read more than one book, so you can compare the features and characteristics of several different models. This information will help you select the best computer for your needs.

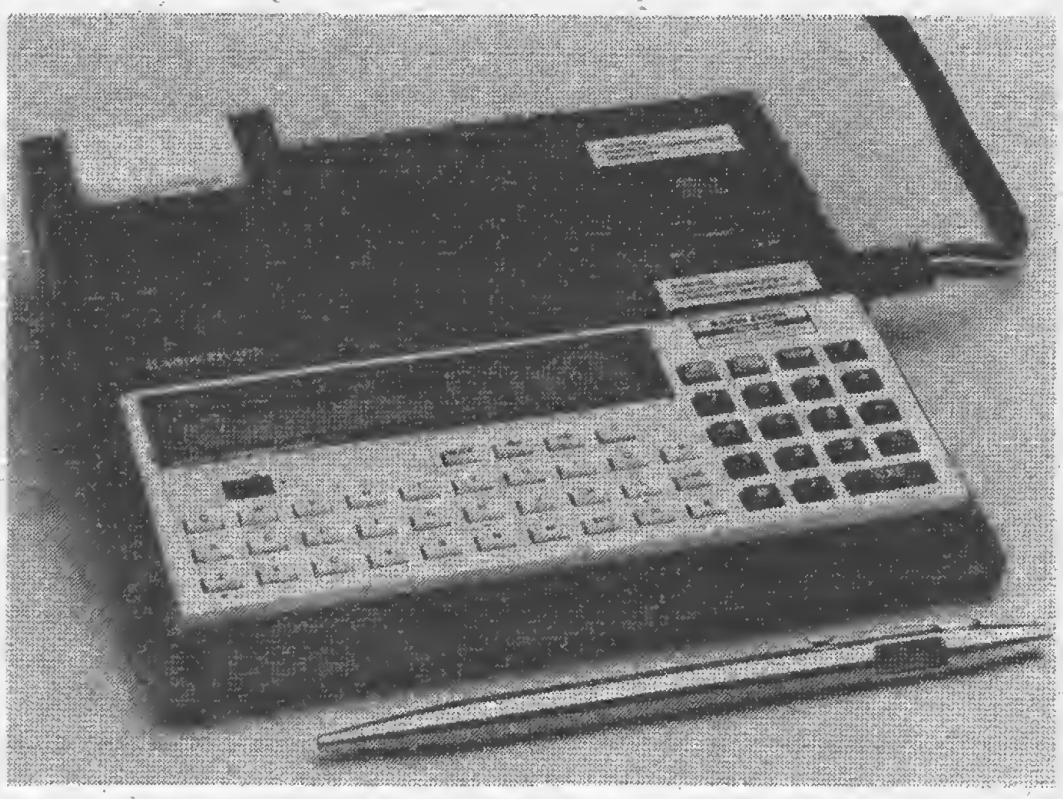


Figure 1.3 Radio Shack's handheld computer

WHAT'S IN THE REST OF THIS BOOK

Before a computer balances your checkbook or helps you keep in touch with the office when you're 2000 miles away, you should learn a bit about how it works and what it can do. You will quickly discover there are many different ways of getting the computer to do a particular job. Several packages of financial analysis programs, for example, are available for the Model 100. Such programs differ in price, features, and ease of use. You won't want to buy everything that is available, but how do you decide? This book should help you make good decisions. It describes many of the programs currently available for the TRS-80 Model 100. We assume that you aren't a computer expert but would like to know a lot more about how you

can use a Model 100. If you already own a Model 100, you may learn some new ways of using it. Each chapter in *Things To Do with Your TRS-80 Model 100 Computer* introduces you to one area of computer use. Many of the chapters begin with some general background information. Then detailed information on programs or accessories for the Model 100 is presented. This book won't make you a computer *expert*. Instead, it will help you become an informed consumer.

You can skip around in this book as much as you like. If you are interested in video games, for example, you don't need to read the chapter on business applications. Here is a list of the chapers and a short description of their content:

Chapter One. *Introducing the TRS-80 Model 100*. In this chapter you find out what a personal computer is and some ways you can use it. We also give you a brief guided tour of the Model 100; and we introduce *software*.

Chapter Two. *Word Processing*. The Model 100 won't replace your TRS-80 Model 4 or an IBM PC when it comes to word processing, but it will do a decent job of word processing in the field. You can use the built-in word processing program to compose letters or reports while you're away from your desk or home.

Chapter Three. *The Built-In Schedule and Address Packages*. The Model 100, unlike most personal computers, has several *applications programs* permanently stored in its memory. Two of them are described in this chapter. One helps you keep track of appointments and meetings; the other provides a permanent means of storing addresses, phone numbers, and names.

Chapter Four. *Making the Model 100 Talk with the Model 4*. Portable computers like the model 100 don't have all the features of a full-size desktop personal computer. Radio Shack wisely compensated for that by making it possible to transfer data (for example, a report you wrote while on a trip) from the Model 100 to the Model 4 computer. Once the data is in the memory of the Model 4, you can do anything with it you could with material originally created on the Model 4.

Radio Shack made it possible to transfer data from the Model 100 to the Model 4, but it didn't make it easy. This chapter explains some of the problems and shows you how, step by step.

Chapter Five. *Programming*. The Model 100 speaks a computer language called BASIC. This chapter introduces the concept of writing programs in a computer language.

Chapter Six. *Some Basics of BASIC*. This chapter introduces BASIC and shows you how to begin working with the BASIC used by the Model 100.

Chapter Seven. *Using BASIC Programs*. This chapter continues the discussion of BASIC and explains how you can type in and use programs written in this language.

Chapter Eight. *Tapping into the World: Telecommunications*. Did you know the Model 100 sitting on your kitchen table can be used to communicate with computers all over the world? The Model 100 even includes the telecommunications program you need and a device called a modem, which is also required. The software and the modem are often $150 to $300 options on other personal computers. You can get all sorts of information, from Italian train schedules to reviews of the latest movies, when you use the Model 100 as a telecommunications device. Chapter Eight shows you how.

Chapter Nine. *Business Applications*. Regardless of your profession or the type of work you do, there is probably some aspect of your daily activities that could be improved or made more efficient by using a computer. This chapter is a brief overview of the ways a computer can be used on the job, with an emphasis on the Model 100. Several software packages for the Model 100 are reviewed.

Chapter Ten. *Other Programs for the Model 100*. If we couldn't fit it into one of the other chapters, we put it in this one. Educational, recreational, and graphic programs are discussed in this final chapter.

DO YOU HAVE TO LEARN TO PROGRAM YOUR COMPUTER?

You may have heard that you will have to learn to *program* the computer before it will do anything useful. It is true your computer can't do anything until it gets a program written in a computer language it understands, but *you* don't have to write it.

Computer languages can take weeks or months to learn. Programs (software) that do complicated and useful things take time to write. Writing computer programs is an interesting hobby (or profession) thousands of people enjoy. You may decide you want to learn to write programs in a language like BASIC (Beginners All-purpose Symbolic Instruction Code). (We'll talk more about BASIC later.) Programming doesn't appeal to everyone who uses a computer, however. Fewer than ten percent of the people who own personal computers spend much of their time writing programs. This means the great majority of people do not write their own software. Instead, they buy software someone else has written. This book introduces you to computer programming, *and* it shows you how to select and use software written by other people.

You don't have to program the computer to use it, and most people don't. You can use your computer on many different levels. You may choose to regard your computer as you do any other appliance and simply use it as a labor-saving device. Or you may become fascinated with its internal workings and continue studying and learning about computers for the rest of your life.

This book is aimed primarily at those who want to use their computer to accomplish tasks. If that is how you want to use yours, you won't have to learn too much of the computer jargon that is currently in vogue. The bad news is that you will have to learn a little jargon. You had to know a little jargon to learn to drive your car. Most of us learned the terms, concepts, and

principles needed to drive a car as we were growing up. By the time we were teenagers, the automobile had become a commonplace necessity for most families. Common terms like ignition, premium gas, gas pedal, and brake were jargon when the automobile was first introduced, but today these terms are taken for granted. Jargon associated with the use of telephones has also become a part of our everyday language. The same thing will be true with computers. The next generation may well take for granted a computer on the dining table or in the recreation room. Kids will take terms like RAM and ROM in stride, because they grew up with them and understand how to use computers. Unfortunately we are part of a transitional generation. We didn't grow up with this inexpensive and useful technology. We are *automobile literate* and *telephone literate*, but we aren't *computer literate*. We'll try to help you solve this problem in three ways. First, as we introduce each computer term, we define it. Second, we have a little introduction to computer terms and concepts later on in this chapter. Third, there is a glossary in the back of the book.

HARDWARE AND SOFTWARE

Before we get into specifics, it is important that you understand two general computer terms. *Hardware* may conjure up visions of eggbeaters or pipe fittings, but it really refers to any piece of computer equipment. The computer itself is a piece of hardware, as are accessories like printers.

Software refers to the programs that make your computer do a specific task. The mass media often make it seem very easy to get a computer to do what you want. Television programs and movies often show people making a computer perform simply by talking to it. As you may have already discovered, your computer isn't that friendly yet. (Actually, we talk to our computers all the time, usually when they don't do what we want, and what we say is often x-rated!) Communicating with a computer today usually involves typing instructions on its keyboard or transferring information stored

electronically on a *cassette* or *disk* into the electronic memory of the computer. The Model 100 uses only cassette data storage, but the Model 4 can use either cassette or disk. The instructions a computer follows when it performs a particular task are called *software*. It takes software to make hardware useful.

OH, NO! JARGON!

It's not as bad as all that. We're just going to give you a little guided tour of jargon, as well as an introduction to the

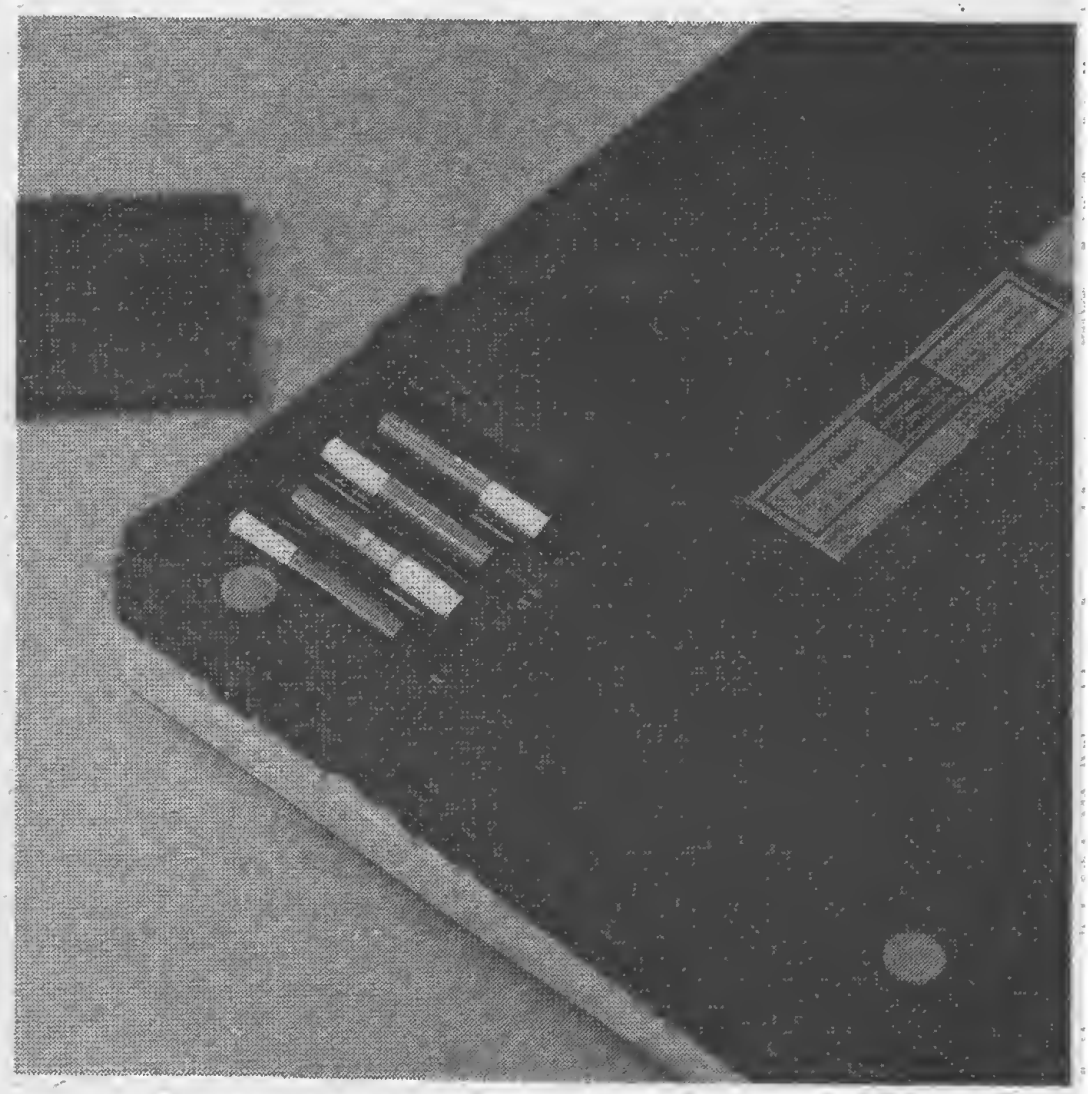


Figure 1.4 Model 100's battery compartment

TRS-80 Model 100. We'll discuss each of the major elements in a Model 100 system.

The Power Supply

The computer uses four AA penlite cells for power. They will operate the computer for around twenty hours. An AC adaptor for the computer is a very reasonable $5.95. Twenty hours of operation on penlite cells may sound like a long time, but many owners use the computer that many hours in only a few days. If you frequently operate the machine on battery power, you may want to invest in two sets of rechargeable batteries. One set can be charging while the others are in the computer. Several companies sell AA size rechargeable batteries. One Model 100 owner hooked his up to an ordinary six-volt lantern battery, which gave him about 120 hours of

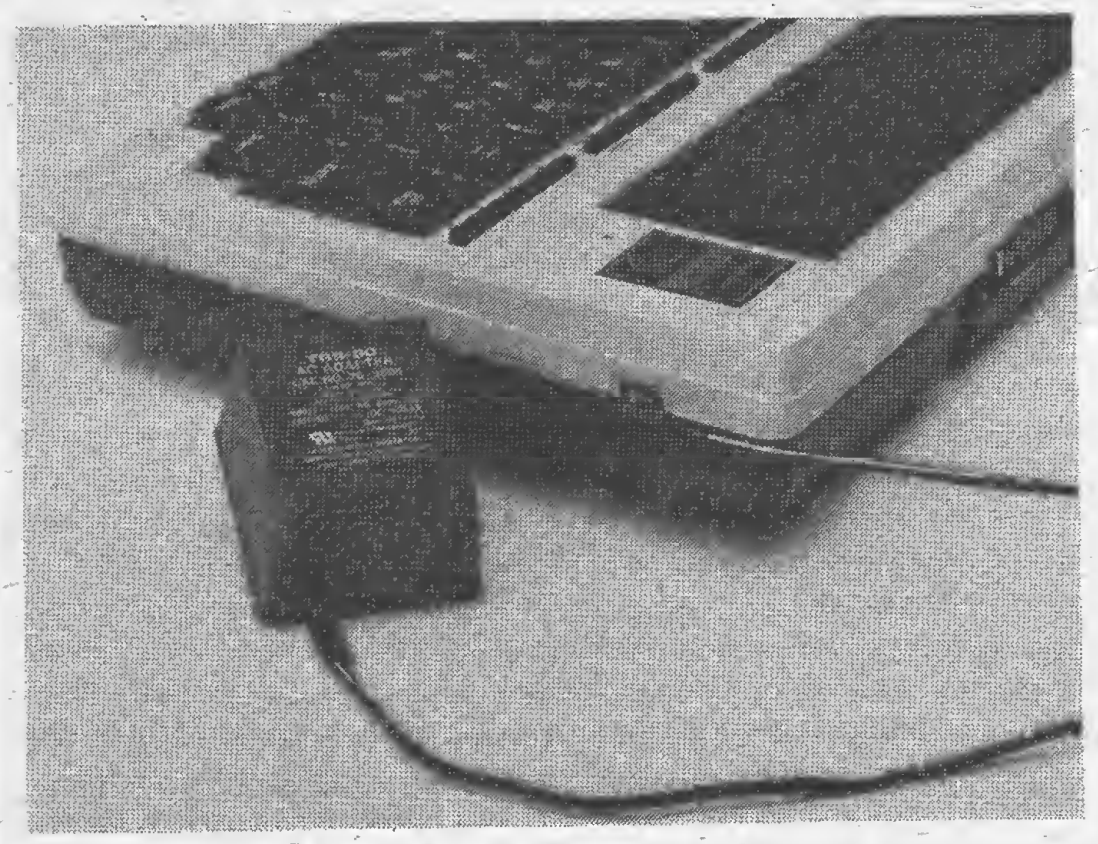


Figure 1.5 Power supply

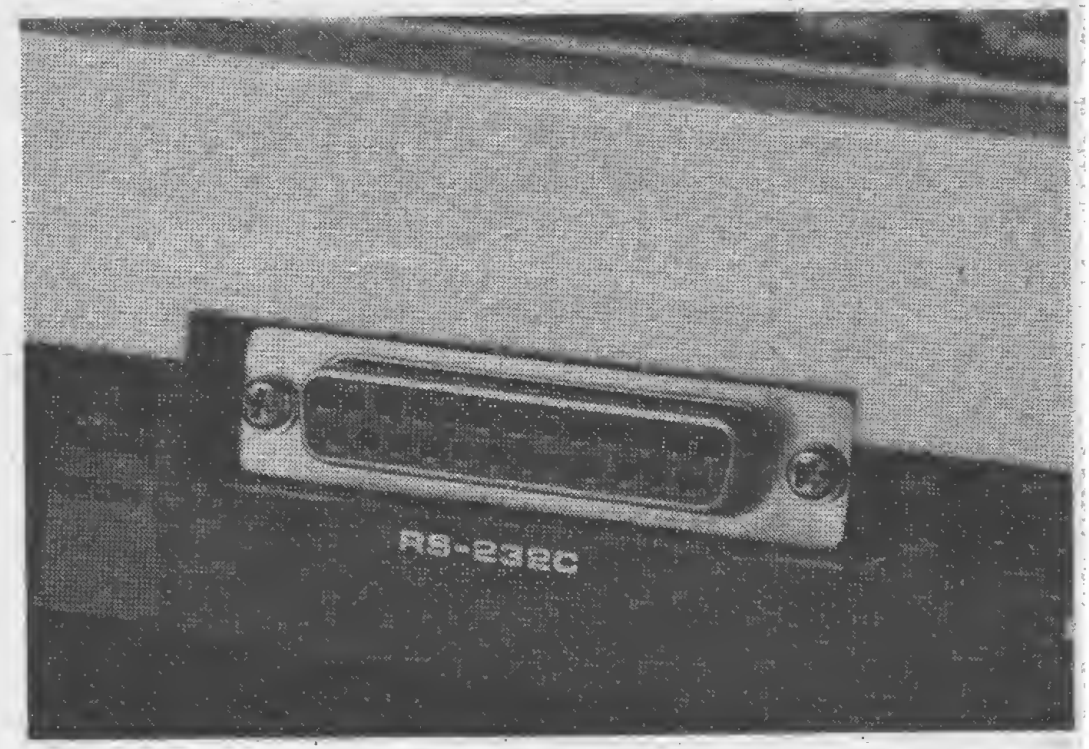


Figure 1.6 Serial port

operation. He connected wires to the positive and negative terminals on the battery and to the power connector on the Model 100.

I/O Ports

I/O is an abbreviation for *input/output*. If a computer is to be of any use, it must be able to communicate with you. This basic function is called input/output. The places on the computer circuit board where I/O occurs are often called *ports*. The Model 100 has several standard ports that allow you to communicate with it. The keyboard is your primary means of entering data and instructions into the computer. The keyboard port is an integral part of the computer. A port or interface for the computer's display is also built in, as is a port for connecting an ordinary cassette recorder.

There are two types of general purpose I/O ports in common use today on personal computers: serial and parallel. Many peripherals like printers must be connected to the computer through either a parallel or serial port. Serial printers accept

data a bit at a time, with each character code being made up of seven or eight bits. Parallel printers accept data eight bits at a time over eight separate lines. Some computers, particularly the inexpensive models, charge extra for serial and parallel ports. The Model 100 has one serial and one parallel port as

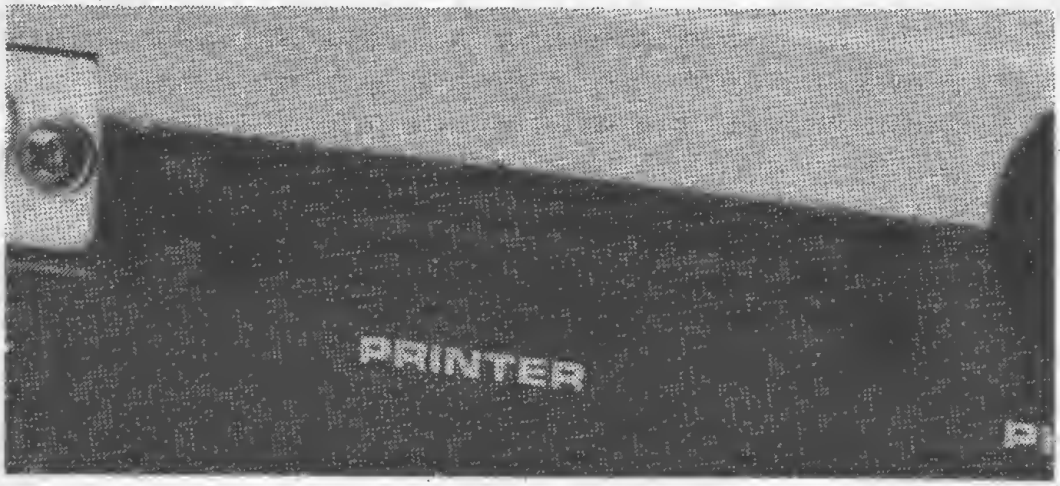


Figure 1.7 Parallel port

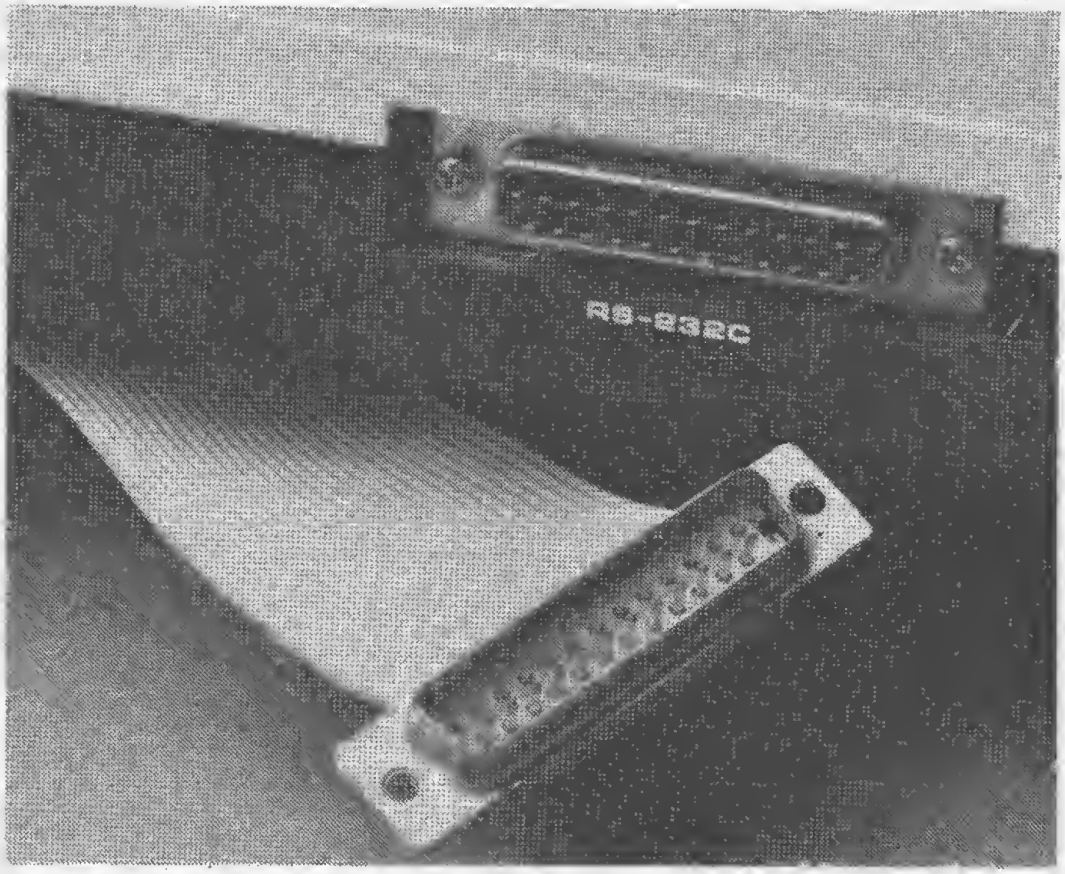


Figure 1.8 The serial cable uses 25 pin-D connectors.

standard equipment. The computer also has a built-in modem and a connector that lets you run a cable directly to a phone jack. When you buy the $20 computer-to-telephone jack cable, you even get an hour on the Dow Jones News/Retrieval information utility and one hour on CompuServe, another information utility. Both of these will be explained in detail in a later chapter.

Another standard port lets you connect a bar code reader to the computer. Bar codes are printed lines like the universal product codes on cans at the grocery store. This computer can read bar codes, if you have the right software.

All in all, the Model 100 is well equipped with I/O ports. Adding a serial port, a parallel port, and a modem would cost over $350 on some machines. The Model 100 also has a little cartridge compartment with a removable door. Radio Shack hasn't said exactly what's planned for that slot, but a good

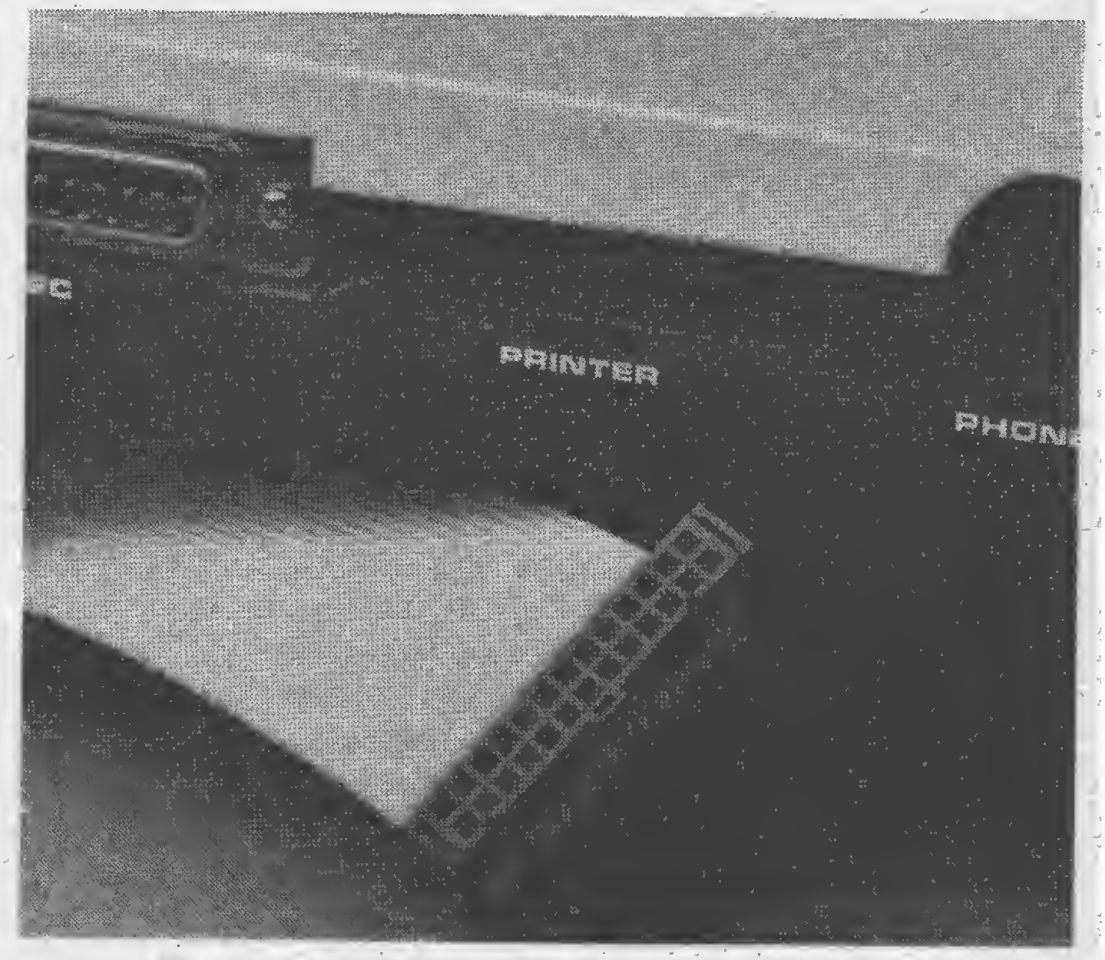


Figure 1.9 The parallel port with printer cable

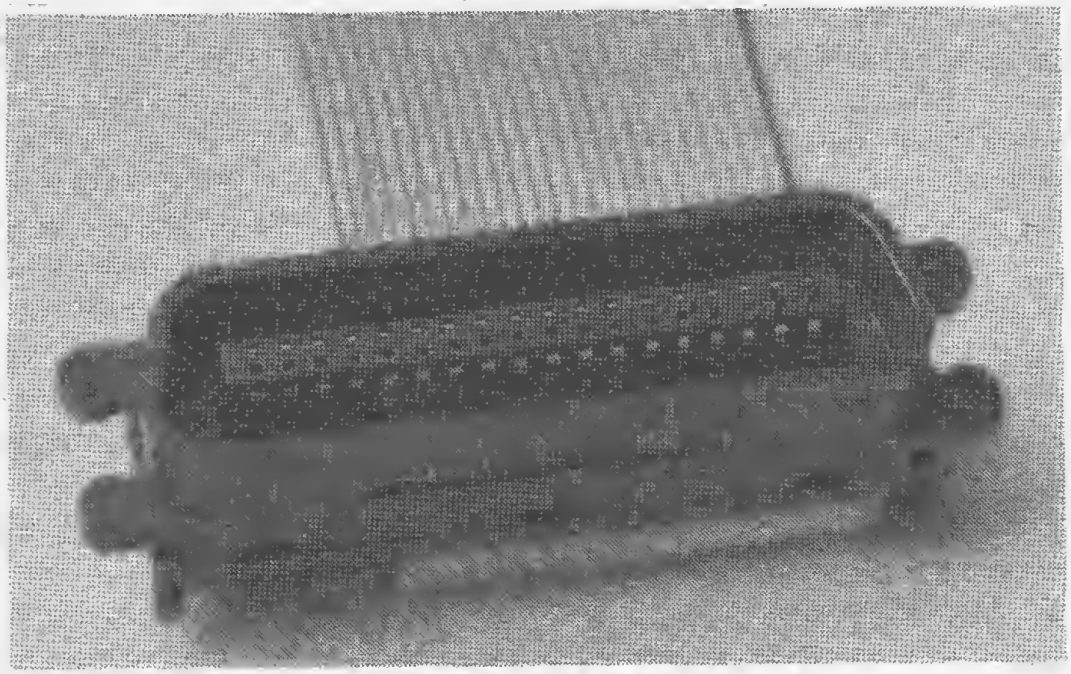


Figure 1.10 The printer cable has a "Centronics compatible" connector on the end that attaches to the printer.

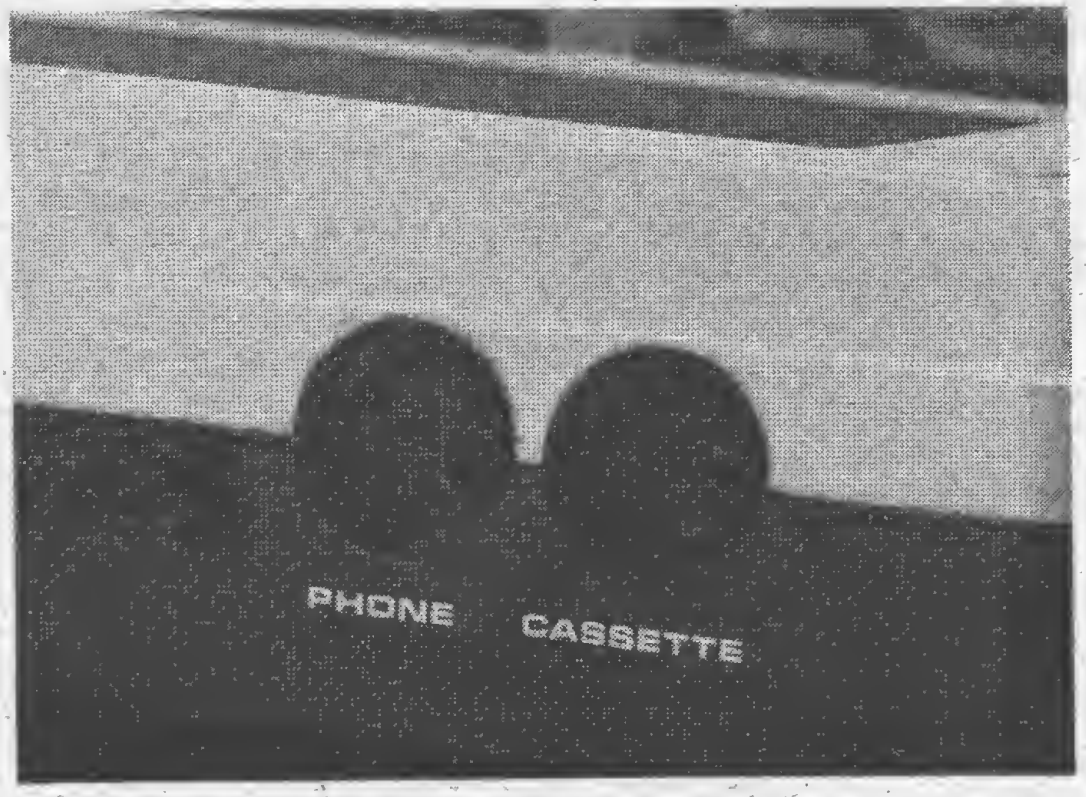


Figure 1.11 Phone connector for computer-to-telephone-jack cable

guess would be they plan to offer several programs for the Model 100 on cartridges.

Keyboard

The keyboard on this computer is small by office computer standards, but it is outstanding compared to the keyboards on handheld systems. It is an *almost* full-size standard tyepwriter-style unit with eight programmable function keys across the top. Ordinary keys, when pressed, produce a letter or number character. Programmed function keys tell the computer to perform a particular function such as delete a character from the screen. Programmable function keys can be custom pro-

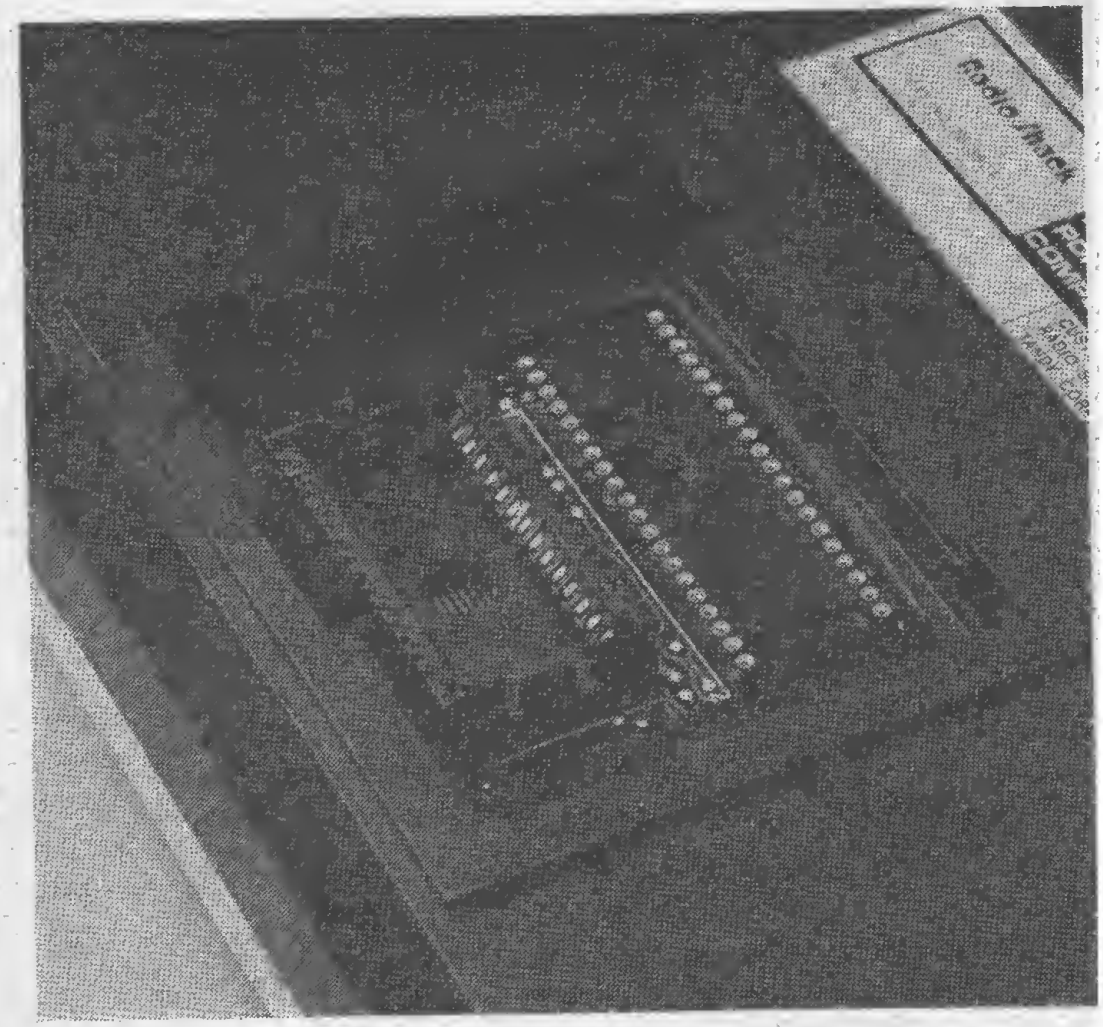


Figure 1.12 Cartridge compartment

grammed to send a particular instruction or set of characters to the computer. Four programmed function keys at the top of the keyboard let you send commonly used BASIC keywords to the computer. On most machines you would have to type out PRINT or BREAK on the keyboard when you want to give the computer those instructions. On the Model 100 you press the key labeled PRINT, and the keyboard sends the whole instruction to the computer.

The keyboard also has four keys that let you move the cursor around on the screen. The *cursor* is a blinking, dark rectangle on the screen that tells you where material you type (or edit) will appear next on the screen.

The Model 100 has a total of 56 keys. Noticeably absent is a *numeric keypad*, which is the equivalent on a computer key-

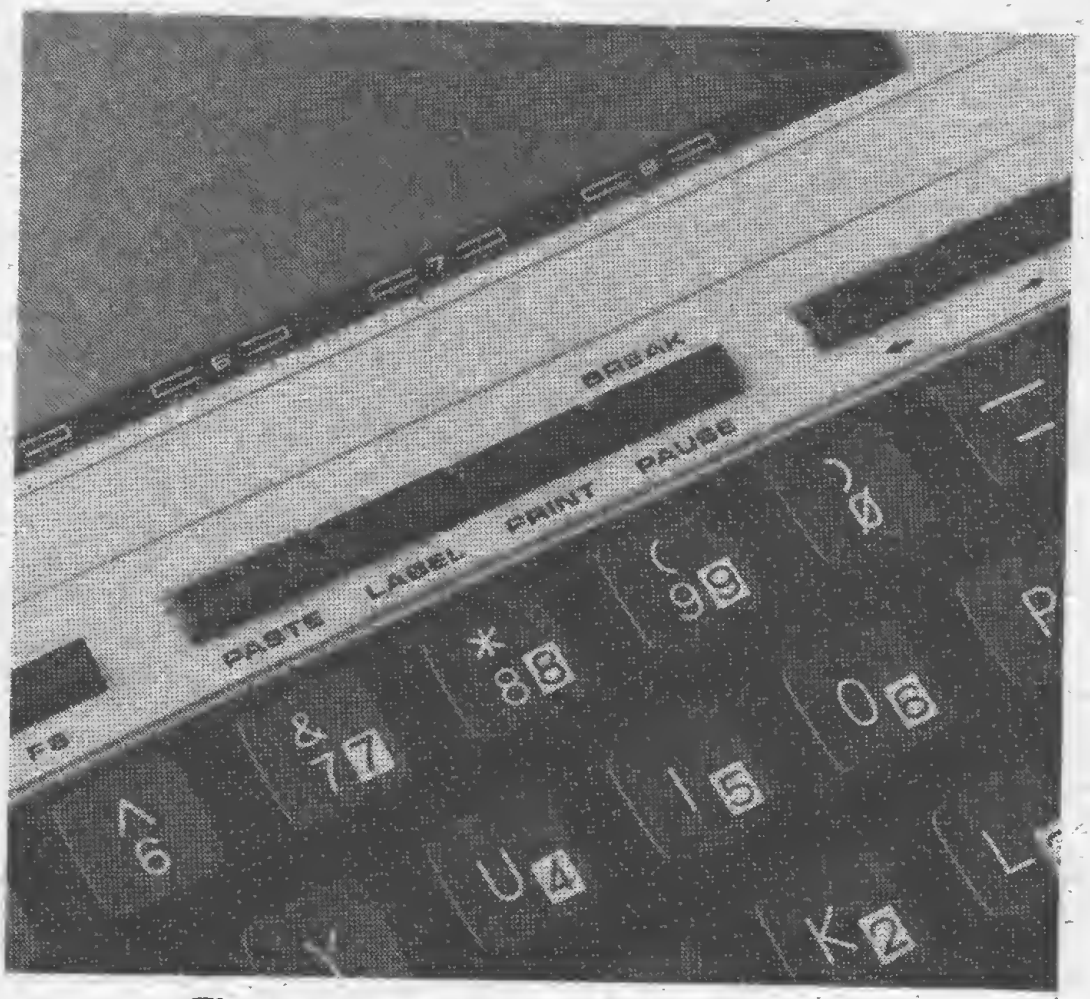


Figure 1.13 Programmed function keys

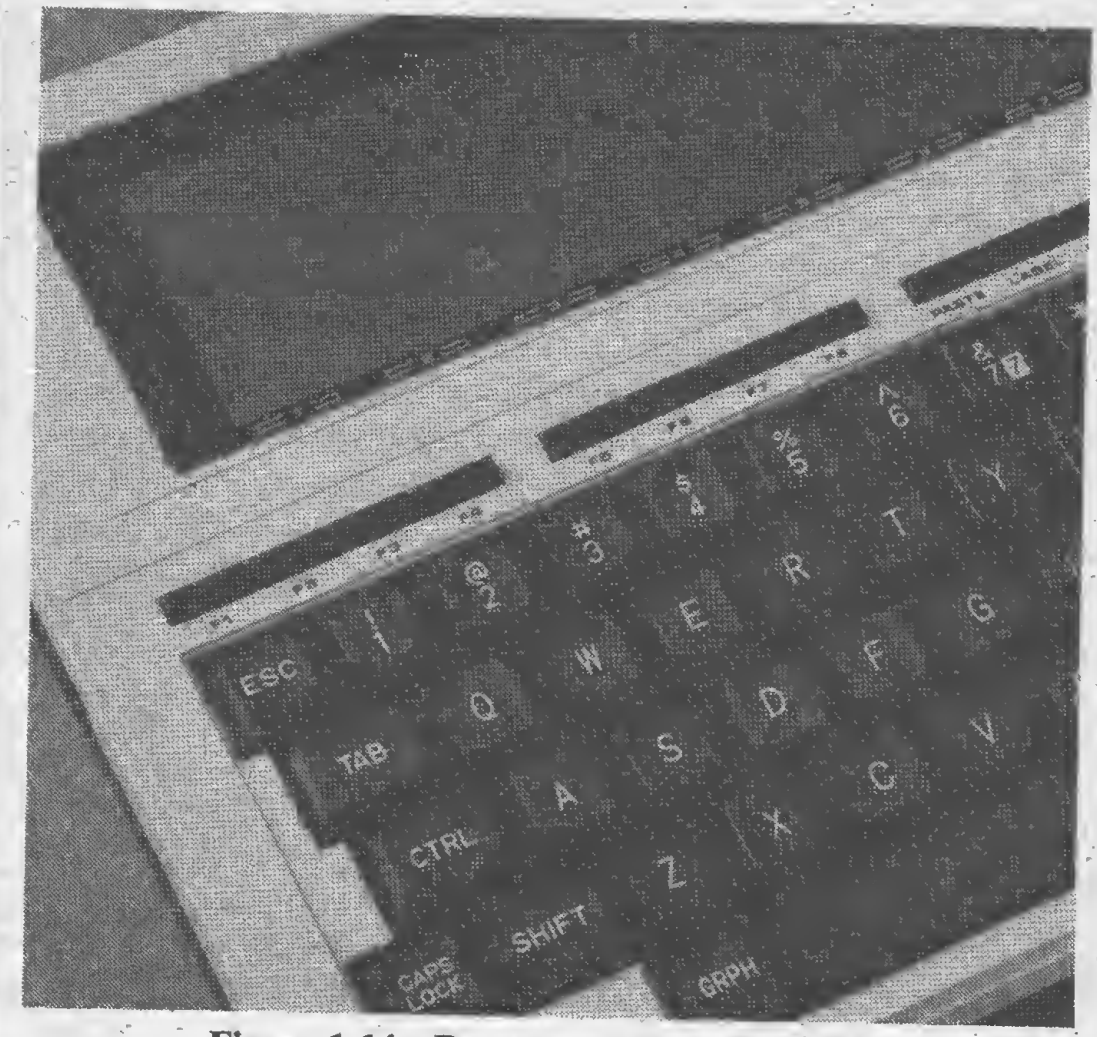


Figure 1.14 Programmable function keys

board of the keys on a ten-key adding machine. The Model 100 makes up for this lack by imbedding a numeric keypad in the regular keyboard. By pressing a key, you can turn the *789uiojklm* keys into the equivalent of a numeric keypad. The Model 100 has a good, usable keyboard.

Video Display

A specially designed liquid crystal display is built into the computer just above the keyboard. It displays 8 lines of 40 characters. This display is very different from the video tube displays most computers use. By using an LCD instead of a cathode ray tube (CRT), Radio Shack was able to pack a very

large amount of readable display into a small, flat screen. An 8-line by 40-character display gives you a total of 320 characters on the screen at one time. This is a far cry from the 2000 characters you can see on a regular tabletop business computer's screen, but it is still enough to enable owners to conveniently write programs in BASIC, do telecommunications work, analyze data, run some game programs, and even do some word processing.

This is certainly not an ideal format for a computer display, but it is very portable. There is even a contrast adjustment on the side of the case. We like the 8-line by 40-character display better than the 22 lines of 23 characters on a VIC 20 computer. Lines of fewer than 30 characters make it difficult to understand what is on the screen, because logical units of text are broken up and placed on several lines.

The display of ordinary text is sometimes called *alphanumeric display* because it is made up of letters and numbers. The TRS-80 Model 100 is also capable of displaying graphs, figures, and illustrations. The character set of the Model 100

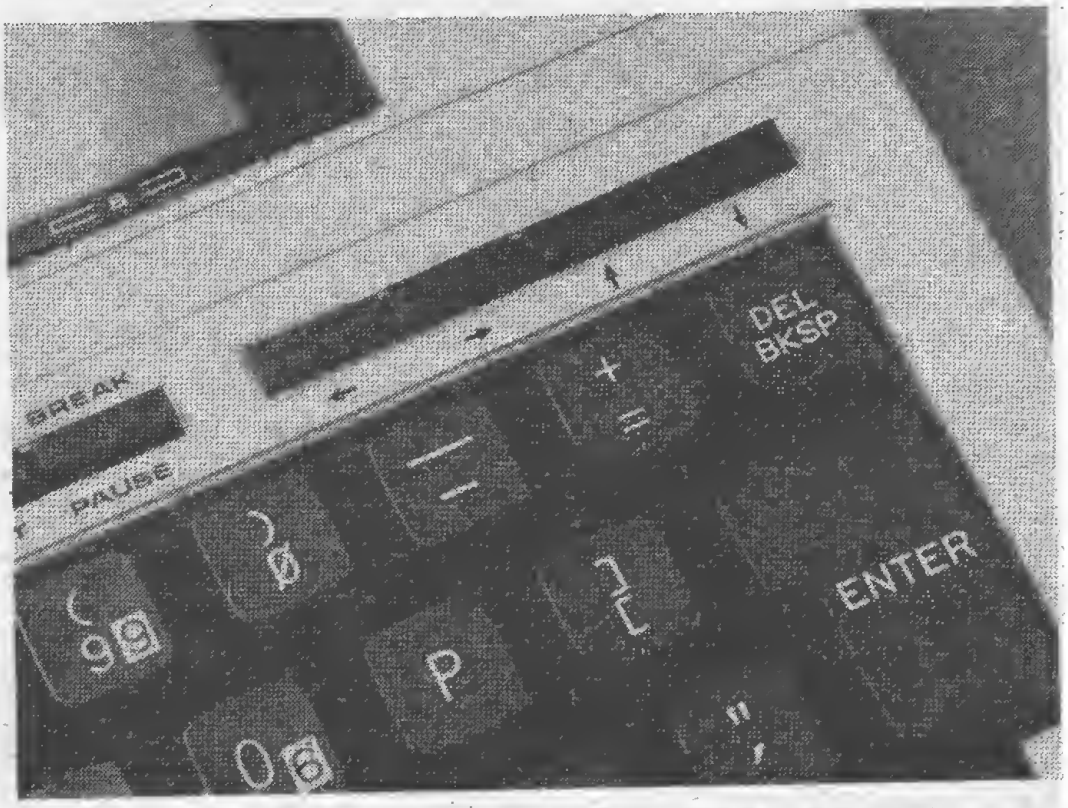


Figure 1.15 Four keys to move the cursor

(all the letters, numbers, and symbols the computer can display on its screen) includes upper- and lowercase letters, numbers, several special math and language symbols, and a set of graphics characters. These can be typed in from the keyboard by holding down the GRAPH or CODE keys and then pressing other keys. If you write a program that displays a bar graph on the computer's screen, you have a *graphics display*. What you see on the screen is composed of special graphics characters. High-quality graphics displays that show fine detail are made up of tiny dots called *picture elements* or *pixels*. The TRS-80 Model 100 can create high-quality pictures and figures made up of thousands of tiny colored pixels. Graphics of this type are called *high-resolution* or *HI-RES* graphics. You can control 15,360 dots on the Model 100's screen when you use it to create HI-RES graphics. Those dots or pixels are divided into 64 lines of 240 pixels.

Optional Video Output

As we mentioned earlier, one of the greatest limitations of a computer like the Model 100 is the very small screen. In many situations a larger format on a ordinary video display is sorely needed. With the appropriate software you can turn the Model 100 into a computer with a full-screen capacity.

Traveling Software, the same company that is producing one of the bubble memory devices mentioned later, is also marketing a software/hardware package called *Traveling Road Show*. *Traveling Road Show* includes an interface that plugs into the bottom of the Model 100 and connects to either a computer monitor or a TV set. With this package, you can either get a blown-up version of the 40-column by 8-line display, or you can use a larger 40-character by 24-line display. The major use of this software will be to enable you to use the Model 100 as a teaching device. You can send information stored in the computer to a large monitor and then control a highlighted section of the monitor screen by remote control. The highlighted portion of the screen is used like a pointer to

draw the attention of the audience to certain places on the screen. You can move this large cursor-like highlighter about on the screen in several ways:

- You can move a mouse-like device around on a handheld rectangular board. As the mouse moves, so does the cursor-like pointer.
- You can move the pointer by just moving your finger around on a rectangular board similar to the one used with the mouse.
- You can use a joystick to move the cursor.

This package is so new that we were unable to get a firm price on it, but Mark Eppley at Traveling Software assured us that the price would be very competitive ($200?).

Memory

When you press a key or load a program into the computer from a cassette tape, there must be somewhere to put that information. Each letter you type in is converted to a code and stored in the memory of the computer. All computers convert characters into ones and zeros (on and off electrical signals). The letter A, for example, has the code 01000001. Such a set of eight digits is called a *byte*, and each of the ones and zeros is called a *bit*. Seven of those bits are used to define the code for each character the Model 100 understands. The eighth is usually added to the character code so the computer can check for errors. This process, called *parity checking*, will not be discussed here. Bytes, the eight-bit patterns, are the fundamental code units for the Model 100 and for most small computers.

Memory inside the computer is also divided into bytes. One byte of memory can hold the electrical impulses that represent eight ones and zeros. Every letter, digit, graphics symbol, and punctuation mark the Model 100 understands has a unique code that is one byte (eight bits) long. Thus there is not a place in

the computer where an A or B or 7 or + is stored. Instead, each of those symbols has its own one-byte code. This code is what is stored in the memory of the computer. The code the Model 100 uses is called ASCII (American Standard Code for Information Interchange), which is used by virtually all other personal computers.

The Model 100 comes with at least 40,000 bytes of memory, but not all of it is available for general use. There are actually two different types of memory in the TRS-80 Model 100: RAM and ROM. ROM stands for Read Only Memory. This type of memory is generally programmed at the factory. The contents of ROM cannot be changed by the user. A little over 40,000 bytes of ROM are in the Model 100. The instructions that allow the computer to understand BASIC, a popular computer language, are in ROM. When the TRS-80 Model 100 is turned on, it automatically goes to the section of ROM where the instructions for displaying its *menu* are stored. The menu is a display on the screen of the programs the computer can run. Since the Model 100 has four programs stored permanently in its ROM, you can select from any one of them. The computer

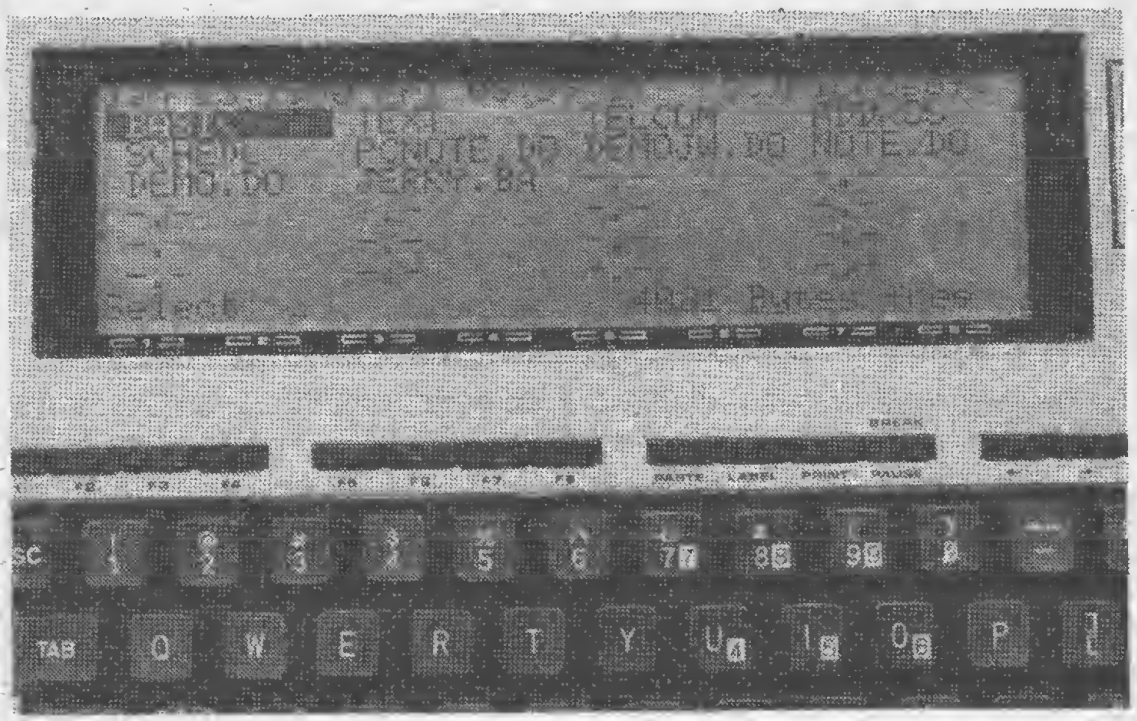


Figure 1.16 The Model 100's menu

can prepare itself to work in BASIC, it can get ready to do word processing (using the TEXT program), to telecommunicate, or to work with the address program. All you need to do is press a few keys, and the computer is ready. Since the Model 100 has an expansion slot underneath, you will probably be able to buy additional programs stored in ROM cartridges and plug them in.

All computer memory cannot be ROM, however. Much of

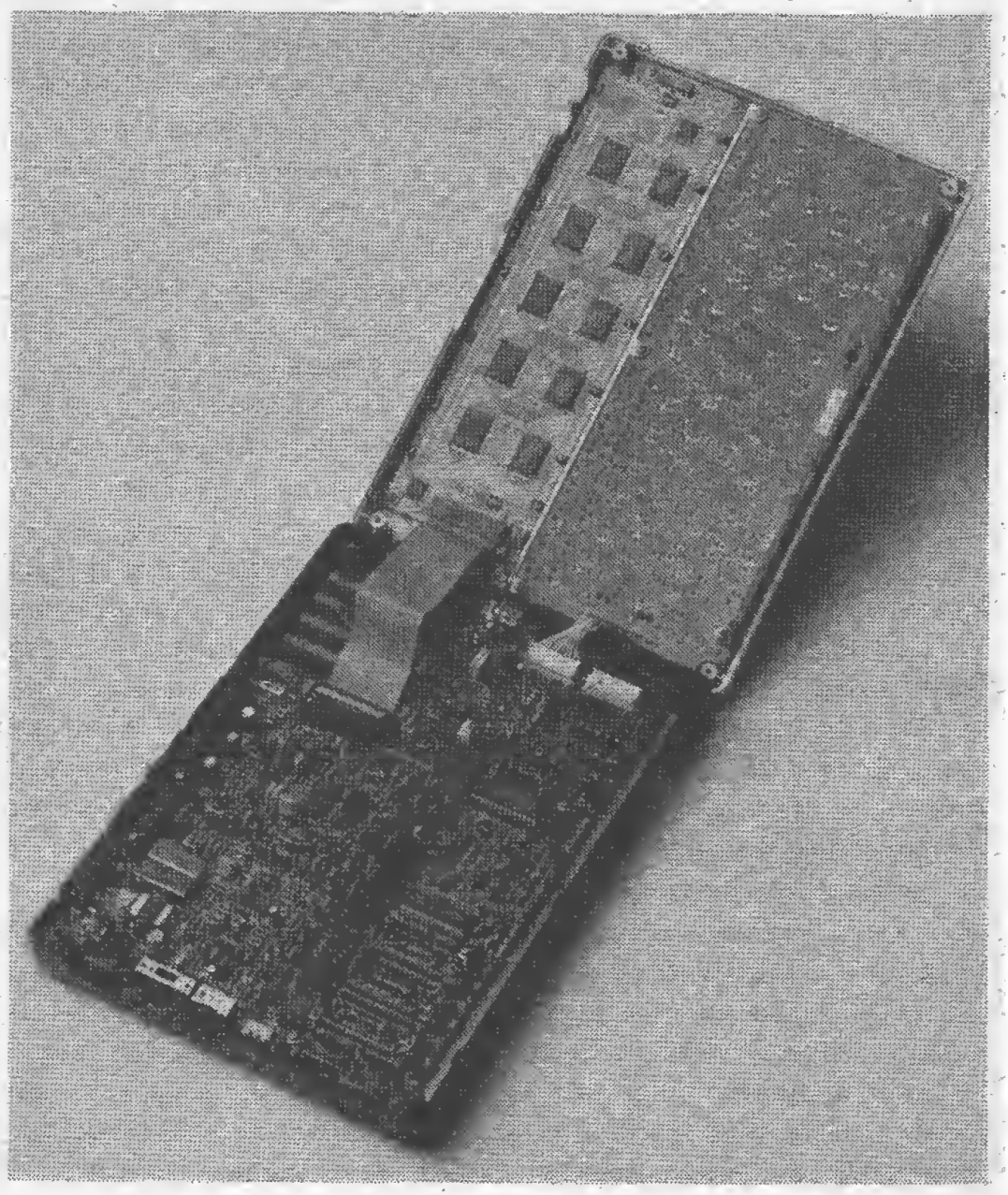


Figure 1.17 Getting "into" the Model 100

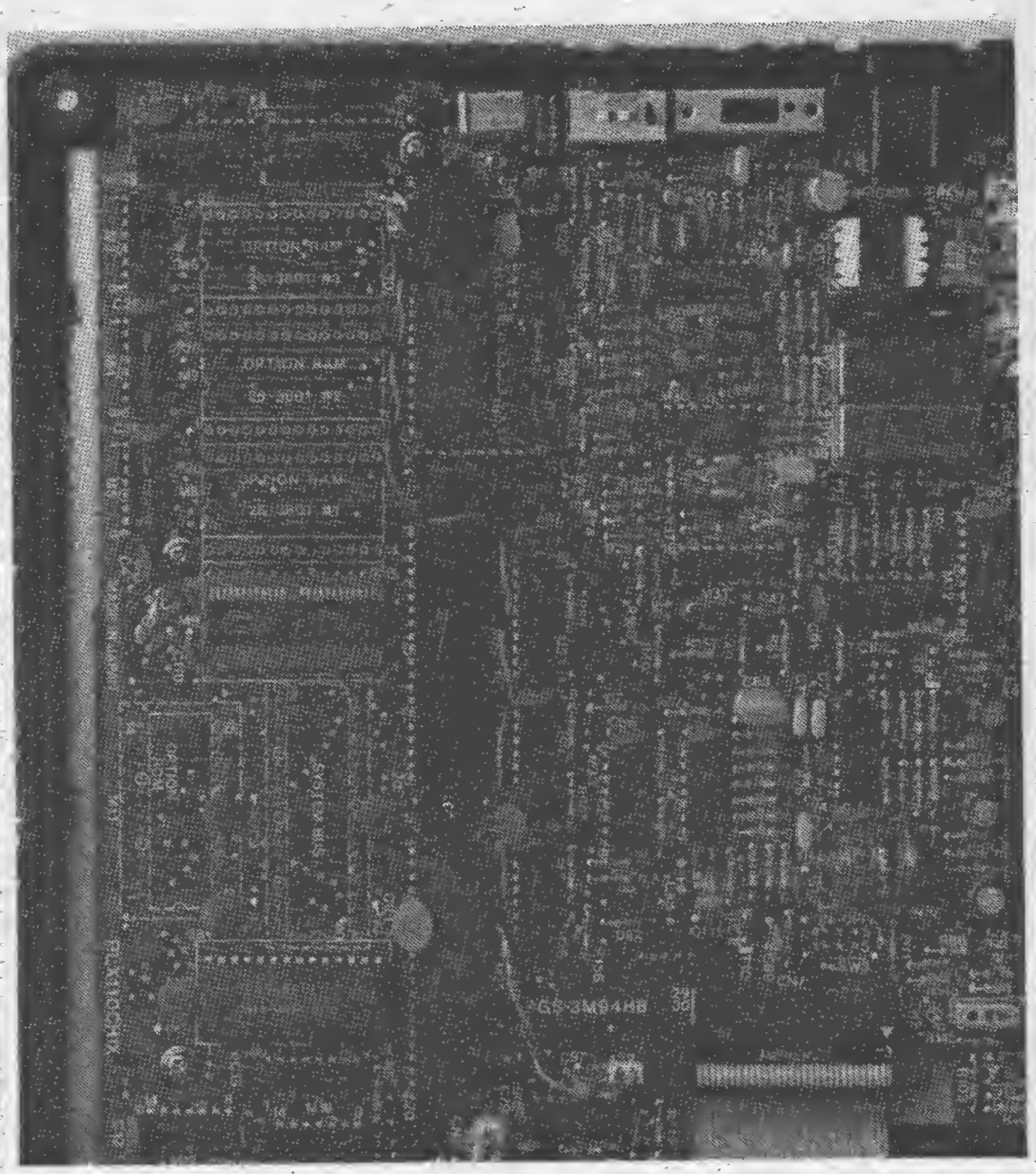


Figure 1.18 Area of Model 100 circuit board where ROM and RAM are installed.

the memory in the Model 100 is RAM, or Random Access Memory. RAM is general-purpose memory that is available for use by the computer operator. There are two versions of the Model 100 which have different amounts of RAM. The $799 version has a little over 8,000 bytes of RAM, and the $999 model has just over 24,000 bytes of RAM. The computer will use up to 32,768 bytes of RAM. Radio Shack sells an

extra 8192 bytes for $120 plus a charge for installing it. RAM is where material you type in (for instance, programs, or documents created by the word processor) is stored.

Thus far, we've talked about the number of bytes of memory in the Model 100. Computer buffs generally do not talk about memory in terms of bytes, but in terms of K, the abbreviation for Kilobyte. Each K of memory is 1024 bytes. Thus 16K would be 1024 times 16 or 16,384 bytes. Just multiply the number of K by 1024 to determine the number of bytes of memory.

Normally, material in RAM is lost when the computer is switched off. That's the reason RAM is sometimes called *volatile memory*. The RAM in the Model 100 is a special type called CMOS RAM, which uses very little power and can be held on standby with a minuscule amount of power. That means the computer can feed a small amount of power to its RAM chips even when it's switched off. You can thus keep all your data in RAM for up to thirty days. The contents of memory is retained even if you change the batteries, because it has a built-in set of nickel cadmium batteries to take care of the memory. They recharge themselves from the AA batteries and will run for thirty days even if the AA batteries are removed. We should caution you that thirty days is the maximum and applies only to systems with 8K. If you add more memory to the system, the rechargeable batteries may be able to maintain data for only eight days, or less.

Optional Memory

Despite the semi-permanent memory system built into the Model 100, one of its chief disadvantages at first glance seems to be its limited memory capacity. Some very interesting devices are already being developed to overcome this problem.

Bubble Memory

Bubble memory is a way of storing information in microscopic magnetic bubbles. This type of storage system serves

a similar purpose to magnetic disks or magnetic tapes, but the bubble memory system uses no mechanical devices to perform the storage operation. A bubble memory system works very much like the memory that is inside the computer, except that it requires no power to keep it stored. Once it is there, it stays there, unless the device is damaged or you change it.

This is sometimes called non-volatile memory: there is no chance of losing the information when the power is turned off. Two companies are now marketing bubble memory for the Model 100. Both of these devices will hold huge amounts of information and have the potential for adding a great deal to what can be done with this computer.

Green Mountain Micro has designed a bubble memory device that plugs into the bottom of the Model 100. It is completely portable and is designed to be used as a mass storage device (see the section on mass storage later in this chapter). The basic unit will store 128K of memory and will sell for $800. Additional storage space can be purchased for $300, bringing the total capacity up to 512K.

Traveling Software has developed a bubble memory device that will have a maximum capacity of one megabyte (one million bytes). This device is designed specifically for the Model 100. A firm price for it had not been established by Traveling Software at the time this was written. Mark Eppley at Traveling Software will be more than willing to give you more information.

The CPU

The CPU, or Central Processing Unit, is the heart of a computer system. The CPU is the chip that actually processes data; most of the other components support the CPU as it does its work.

Although most CPUs are smaller than a half dollar, the electronic components they contain would have filled a room a few decades ago. Large scale integration technology permits manufacturers to cram thousands of circuits into tiny silicon

chips. These chips work dependably and use less power than an electric razor.

The TRS-80 Model 100 uses a special low-power version of the 8085 microprocessor chip.

Mass Storage

Random access memory serves as a temporary storage medium for data or program information while a program is running. You also need a way to store programs and data outside the computer. For example, you might write a report with

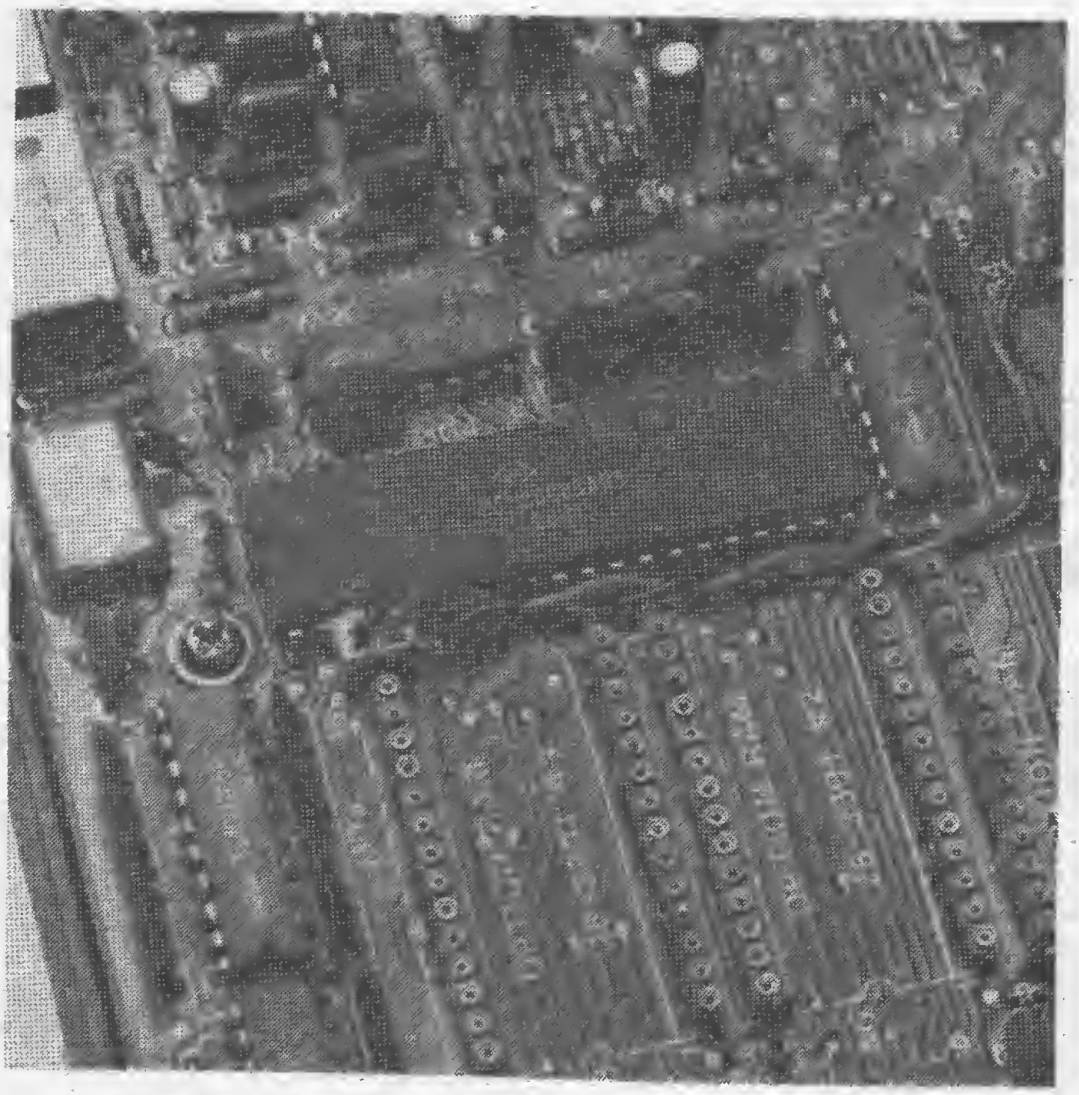


Figure 1.19 The Model 100's Central Processing Unit: 80C85 Microprocessor Chip

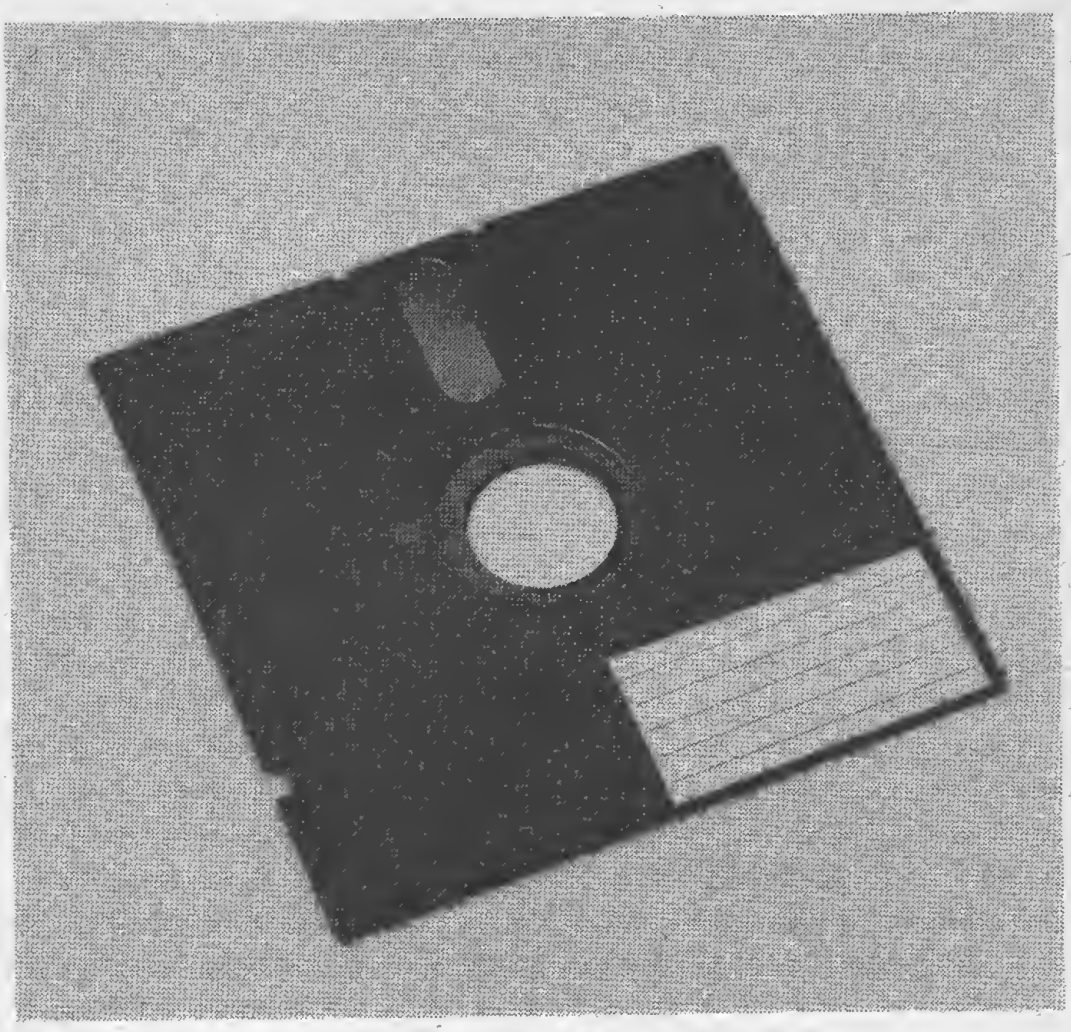


Figure 1.20 Floppy disk

several sections. The memory of the computer might hold one of the sections, but not all of them. A functional computer system must, therefore, have some method of permanently storing programs and data externally. The TRS-80 Model 100 comes with the circuits needed to use an ordinary cassette recorder to store programs and data. Radio Shack even sells a tape recorder (RS 26-1208, $60) specially designed for computers. A more compact model that runs well on batteries is also available from Radio Shack (RS 14-1011) for $100. Recorders from many other manufacturers will also work with this computer.

Another mass storage option for the Model 100 has already been mentioned: it can be connected to the TRS-80 Model 4. Data is transferred to the Model 4, then stored on cassette or on floppy disks. A disk system provides high-capacity reliable,

high-speed storage. Disk drives use floppy disks—round, flexible plastic platters enclosed in a protective case—to store information. You insert one of the floppy disks in a disk drive, and the computer can magnetically store data on the disk or read data previously stored on the disk.

Software

The TRS-80 Model 100 speaks BASIC because *Microsoft BASIC* is in ROM. Microsoft is a well-known software company that created the BASIC in most of the popular personal computers. The programming skills you learn on this computer will transfer to the many other computers that use the same type of BASIC.

A special type of software called an *operating system* is required to make all of a computer's components work together. The Model 100 has an operating system program in its ROM, also developed by Microsoft.

Operating systems are not that interesting in themselves, however. What is interesting is the *applications software*: programs that let you do something useful, like telecommunications, word processing, or keeping track of phone numbers and addresses. This book concentrates on the applications software available for the Model 100 and on how to use the BASIC built into the machine.

If you are new to computing, you may not realize how important lots of software is to a computer owner. Hardware is useless unless there is software. Some computers, for example, have fewer than fifty programs that will run on them. Others have lots of software, but it is concentrated in one area, like video games or sophisticated business software. The Model 100 is a new computer with several built-in applications programs that let you start using the computer immediately. In addition, at least twenty different companies, including Radio Shack, are hard at work developing all sorts of applications software for this machine. By the time you read this book, there should be at least 200 different programs available, with more available every week.

OWNER RESOURCES

Several other resources are available to someone who buys a Model 100 computer. Here again, you are fortunate. Several authors were writing books on various applications of the computer when this book was written. Check the shelves in a well-stocked bookstore that carries computer books to see what's available.

In addition to books, there are several magazines written specifically for owners of the Model 100. Two had already published their first issue when this book was written. The magazines on Radio Shack computers also cover the Model 100, and several general interest personal computer magazines, like *Personal Computing* and *Creative Computing*, have articles on the Model 100.

Magazines for Model 100 Owners

Portable 100 Magazine is a monthly magazine that costs $25 a year. If the first issue of this magazine is any indication, it will be excellent. The magazine carries articles describing how other people are using their computer, programs you can type in yourself, reviews of hardware and software, and articles on using the computer for applications like telecommunications. We recommend it.

PCM is another excellent magazine for Model 100 owners. Published by the same group that publishes *Rainbow*, an outstanding magazine for the TRS-80 Color Computer, it covers the same general content areas as *Portable 100 Magazine*. An annual subscription (12 issues) is $28.

Here are titles of a few of the articles in the first issue of *PCM*:

"Plotting Graphs: Graphs with the Model 100 and the Color Graphic Printer" by Bob Rosen.

"Compute Financial Ratios and Determine Corporate Soundness" by Vincent Lord.

"BASIC and the 100: How is the Portable's BASIC Different?" by *PCM* staff.

We recommend you subscribe to both the magazines above. They provide owners with current information on new products, through reviews and ads, and the articles are detailed and informative.

Figure 1.21 Magazines for Model 100 owners

Magazines on All Radio Shack Computers

Several magazines publish articles on all the Radio Shack computers. The best known of this group is *80 Micro*, which is a thick monthly magazine with lots of information on programming the computers and on hardware. *BASIC Computing* is a newer, smaller publication that regularly publishes articles on the Model 100. Finally, a new magazine called *Computer User* will be out by the time you read this book. *Computer User* is from the group that publishes *Interface Age*, an established personal computer magazine that focuses on business applications. *Computer User* will publish articles on all the Radio Shack models.

All three of these magazines are available on well-stocked newsstands in most parts of the country.

CHAPTER TWO

Word Processing

The first of the built-in software packages on the Model 100 is the Text Preparation package. Radio Shack is careful not to call this a word processing package, but that is what it is and what it was intended to be. It doesn't have all the features of many word processing packages for larger computers, but it's built right into the machine, and it's surprisingly powerful.

WHAT IS WORD PROCESSING?

Just what *is* a word processor, and why would anyone want one? When most people think about what computers do, they think about the handling of numbers. Most people realize that computers will accept, manipulate, store, and print numbers. Doing these jobs with a computer is called *data processing*.

Computers are also capable of doing similar work with words. When computers are used to accept, manipulate, store, and print words, it is called *word processing*.

Word Processing is Better Than Typewriting

Word processing is the next step beyond typewriting. The invention of the typewriter permanently changed (and simplified) the task of writing. Word processing is now changing (and simplifying) writing again, perhaps more dramatically

than typewriting did! It is far superior to typewriting in many ways.

In typewriting, the first step in producing a document is usually composing a rough draft. The next step involves typing the rough draft on paper. (Some people compose the rough draft directly on a typewriter, but a step which cannot be skipped in typewriting is producing the rough draft on paper.) In business, this process usually involves a secretary as the typist. The typist then gives the writer the rough draft. The writer marks any changes and gives it back to the typist. The typist produces another copy on paper, complete with the writer's corrections, and again gives it to the writer. This cycle can be repeated over and over again, until the writer is satisfied with the document, or until the typist goes into cardiac arrest, whichever comes first.

The really time-consuming part of this whole process is that even small revisions, such as correcting spelling errors, usually mean the entire document must be retyped. This sometimes starts a vicious cycle, because typists often correct one error only to find that they made another someplace else in the document.

Word Processing Makes Revisions Easy

Word processing makes it easy to revise a document. It does this by eliminating some of the steps that must be taken in traditional typewriting. It also saves time by allowing a typist to make revisions quickly. When the typist gets the rough draft from the writer, he or she types it on the computer keyboard, and it appears on the monitor screen. The typist then stores the document on a floppy disk or a cassette tape (so far, the Model 100 can store only on cassette) and types in a simple command that causes the document to be printed out on paper. The writer marks any revisions and gives the marked rough draft back to the typist. The typist then loads the document back into the computer memory, displays it on the monitor screen, and makes the changes desired by the writer. If a word

is misspelled, the change is easy to make, usually by simply positioning the cursor on top of the incorrect word and typing over the top of it. In addition, whole words, phrases, or paragraphs can be deleted by pressing a key or two. Inserting words or longer passages is equally easy. Whole sentences, paragraphs, or even pages can be moved around in the text by typing in a few simple commands. The typist then stores the changed document and prints another copy on paper. Most of the time, even complex changes can be made in a matter of just a few seconds or minutes.

Word Processing Makes It Easy to Produce Copies

Since the document is stored on a cassette tape, it can be printed as many times as you want. Just load it back into the computer memory and print it. This can be helpful when you wish to send many people the same letter and don't want them to know anyone else received one. We've all received form letters like that at Christmastime. They usually begin *Dear Friends* and then go on to tell us fascinating stories about Susie's braces and Fred's little league team. With word processing, letters like that can be mass produced and sent to many different people. That's the good news. The bad news is that lots of people resent letters like that and regard them as cold and impersonal.

With a word processor, you can produce these little Christmas missiles without Aunt Mary or Cousin Lawrence ever suspecting they're numbers 597 and 598 on your list. After each letter is printed, you simply change the name in the salutation, then you print the letter again. You repeat this process until everyone on your list has his or her own personalized letter. You can even add a different paragraph at the end of each letter, customized for each of the people on your list. ("Thanks so much for the stuffed aardvark you sent last year; it's just what I always wanted and looks lovely in the den.")

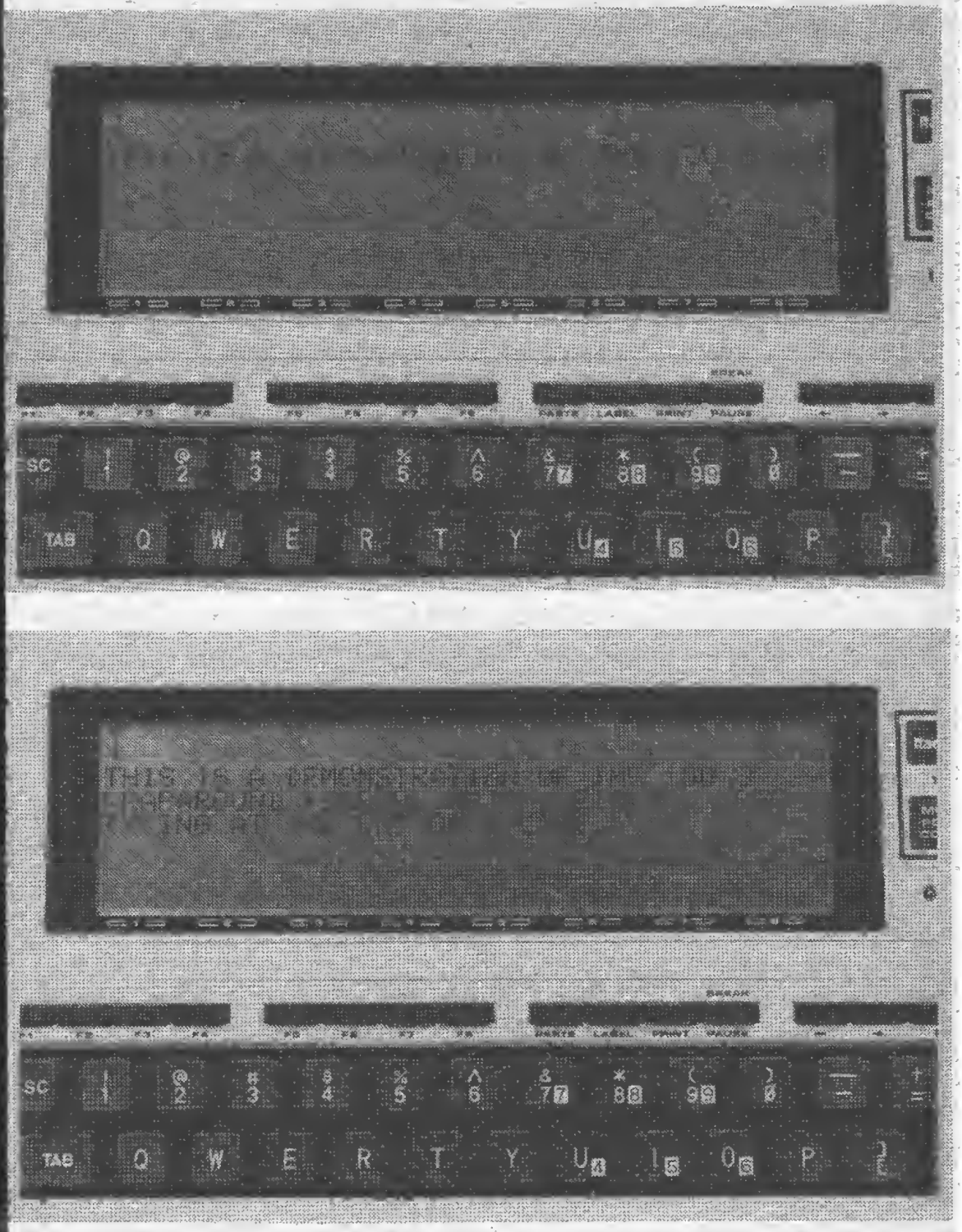
Word Processing Eliminates Many Tedious Typing Chores

Any traditional typist can tell you how tedious it is to listen for the bell that signals the end of the line. Most word processing programs, including the one in the Model 100, have a feature called *wraparound* that makes an end bell and a carriage return at the end of each line unnecessary. When the typist gets to the end of a line, the program takes the last word typed on a line and *wraps it around* to the beginning of the next line if it will not fit on the previous line. If it will fit, the word stays at the end of the last line typed, and the cursor automatically moves to the beginning of the next line.

Another tedious typewriting task is centering headings or varying the margins in a document. With word processing, these can be done by typing simple codes into the document or making selections from a *menu*. Many word processing programs can also *justify* text (make each line end exactly at the right margin), center a block of text on a page, or otherwise change the format of a document. The Model 100 has some limitations here. We'll explain about that later in this chapter.

Word Processing Improves the Quality of Writing

When you know that even major changes can be made quickly and easily, you won't hesitate to try out a different and sometimes better, way of expressing yourself. ("Thanks so much for the stuffed aardvark. It looks lovely in the den and had absolutely nothing to do with the divorce.") If the change isn't as good as the original, you can go back to the first version just as easily. Word processing encourages you to experiment and to refine until you're completely satisfied with a document.



Figures 2.1 and 2.2 Demonstration of the "wraparound" feature of the Model 100's word processing program

Word Processing Is Becoming Popular

In 1981 over 350,000 word processors were in use. Approximately forty percent of all authors were using word processing at that time. Today hundreds of thousands of secretaries, writers, executives, students, teachers, and families use word processing regularly.

THE TRS-80 MODEL 100 AS A WORD PROCESSOR

By now you may have realized that the lack of color graphics, for example, means that the Model 100 is not as good for playing games or for drawing pictures as are computers with good color capabilities. The Apple IIe or the Coleco Adam computers would probably be better choices if your main interests are games or visual arts.

But if you are interested in word processing, we have good news for you: the TRS-80 Model 100 is unique in several respects. First of all, being able to do word processing on a portable computer has some obvious advantages. If you can pick your computer up and take it with you, you can use it to take notes, for example. That eliminates one slow step: taking notes by hand. Not only is it slow to take notes by hand, but lots of people are such messy writers that they can't read their own notes! With the Model 100, you can take notes while holding the computer on your lap or on a table. If you're a good typist, you may be able to enter complete sentences rather than just a key word or two. Then you won't have to take your handwritten notes and try to puzzle out exactly what you meant when you wrote them down.

The Model 100 is ideal for students. You can take the computer to class and use word processing to take notes as the instructor lectures. If you're ill, the teacher can send homework

assignments to you by simply typing them in and sending the computer home. Or she can use the modem to link his or her computer with yours by phone lines and send text to you. You might also choose to take your Model 100 with you when you go to the library to do research. You can take notes, or you can work on the paper right in the library. One school, Dallas Baptist College, feels the Model 100 is so useful they require each full-time freshman to have one. They are given to students when they register, and an extra fee each semester pays for it in four semesters.

If you're a businessperson, you can take the computer to meetings and type in notes for your own use. With the Model 100, some people are able to take minutes that are so well done they don't need polishing-up later on. That's a real time-saver.

You can type in your grocery list and take the computer to the grocery store with you. When you get to the store, you can use the computer to remind you what to buy and to keep track of what you are spending.

You can use the Model 100 in cars, buses, or trains. However, there is one potential problem we should mention at this time. Even though some of Radio Shack's advertising pictures a man using a Model 100 in an airplane, it is doubtful that you will be allowed to do that. We contacted the FAA to ask whether they have rules about using portable computers on commercial airliners. They told us they've not had to deal with this question as yet, but that it is against the law to use portable radios on an airliner because small electronic devices emit radio signals that can interfere with the plane's navigation equipment. Portable computers can also interfere, and the FAA spokesman we talked to indicated a rule against their use would probably be made in the near future. In the meantime, the FAA is leaving this question up to each airline.

We called American, United, Continental, and Pan American Airlines and asked if they would allow the use of the TRS-80 Model 100 computer on board their planes. We got a resounding "No way!" from all four airlines. They allow the computer to be brought aboard but do not permit it to be used

in flight. So unless you have your own Lear Jet, don't count on doing word processing at 40,000 feet, at least on those four airlines. Some people do it on airlines where controls are lax, but the consequences are so severe, we don't think anyone should.

The Model 100 is also great to take to events where you need to keep records. You can use the word processing program to keep track of each player's batting record at a baseball game or to keep score while bowling. You might even write some simple BASIC programs to help you do this. We'll explain that later on in the chapters on programming.

In short, you can use the Model 100 and the built-in word processing program anytime you need to write something down or look at something you have already written.

Screen Display Width and Length

One of the important questions to ask about any computer you are planning to use as a word processor is "How many characters can this computer display across each line?" A general rule of thumb is "the more, the better." The reason you need a computer that can display a wide line is so you can make the screen display width the same length as a line on your printout. In other words, you want the screen display to look just like the printout.

Some computers, and the Model 100 is one of them, can display only a very short line of text (forty characters, to be exact). So when you do word processing, you can't see an entire standard letter-width line all at one time. You can only see a forty-character line.

Now don't misunderstand. We're not describing a *printing* problem, only a *display* problem. When you print the document out, you can choose any line width up to 132 characters. So the problem boils down to this: there is no way to make the display look just like the printout, unless you are planning to print a forty-character line. That's not a fatal problem in word processing, but it is a disadvantage. Most people prefer to

make the computer display look exactly like the printout. You can't do that with the Model 100.

Does that mean other computers, like the TRS-80 Model 4, are better word processors? Yes! On the other hand, you can't carry a Model 4 to class with you and take notes on your lap. There's no such thing as a free lunch, and the engineers had to sacrifice *something* in return for portability!

Another important question is "How many lines of text can I display at any one time?" Again the rule of thumb is "the more, the better." And again, there had to be some compromise made for size and portability. The Model 100 will display eight lines of text at a time. What happens when you've written nine lines? The first line you typed at the top of the screen disappears. In order to see this line or any other that has disappeared off the top of the screen, you press the *up arrow* key until you can see the line you want to see. You then use the *down arrow* key to *scroll down* to the last line you were working on. We'll explain more about this later in the chaper.

A Standard Keyboard

The keyboard is another important thing to look at when you evaluate the word processing potential of a computer. In our opinion, a standard typewriter keyboard is absolutely essential if a computer is to be excellent as a word processor. Some keyboards have small, or compact, keyboards. We think that is almost unacceptable for word processing. It's true that you can get accustomed to just about anything, but like a rock in your shoe, a non-standard keyboard is something you may never feel good about. Almost unbelievably, the Model 100 has an excellent standard-size keyboard. Some compromises had to be made, but Radio Shack wisely chose not to play games with the keyboard. There are quite a few desktop microcomputers whose keyboards are not as good as the Model 100 keyboard.

Spelling and Grammar Checkers

Another important consideration is whether good spelling and grammar checkers are available for use with word processing programs. None were built into the Model 100. That's too bad, but it's understandable. There is room for a limited amount of software in the computer's memory. We'll be surprised if someone doesn't quickly write a spelling and grammar checker for the Model 100. It will probably come on cassette tape, and you'll need a cassette recorder and cassette cable to use it. In the meantime, if it's absolutely necessary, you can transfer what you have written in the Model 100 into a larger computer, like the TRS-80 Model 4, and then use one of the spelling and grammar checkers made for that machine. We'll explain about transferring things from one computer to another in a later chapter.

HOW DOES WORD PROCESSING WORK ON THE MODEL 100?

First turn on your TRS-80 Model 100 computer. The on-off switch is located on the right side and is the switch closest to the front of the machine. This might be a good time to mention that if you turn the Model 100 on and then do nothing else, it will turn itself off after ten minutes. When this happens, move the slide switch to *off* and then back to the *on* position, and you will have power once again. The first thing you will see is a display listing the names of the five built-in programs, called the *Utility Packages*. The word processing package is abbreviated with the word TEXT. In order to use this program, you must use the arrow keys (upper right side of the keyboard) to move the *cursor* on top of the word TEXT (the cursor is a large black rectangle) and press ENTER. The original display will disappear and you will see the words:

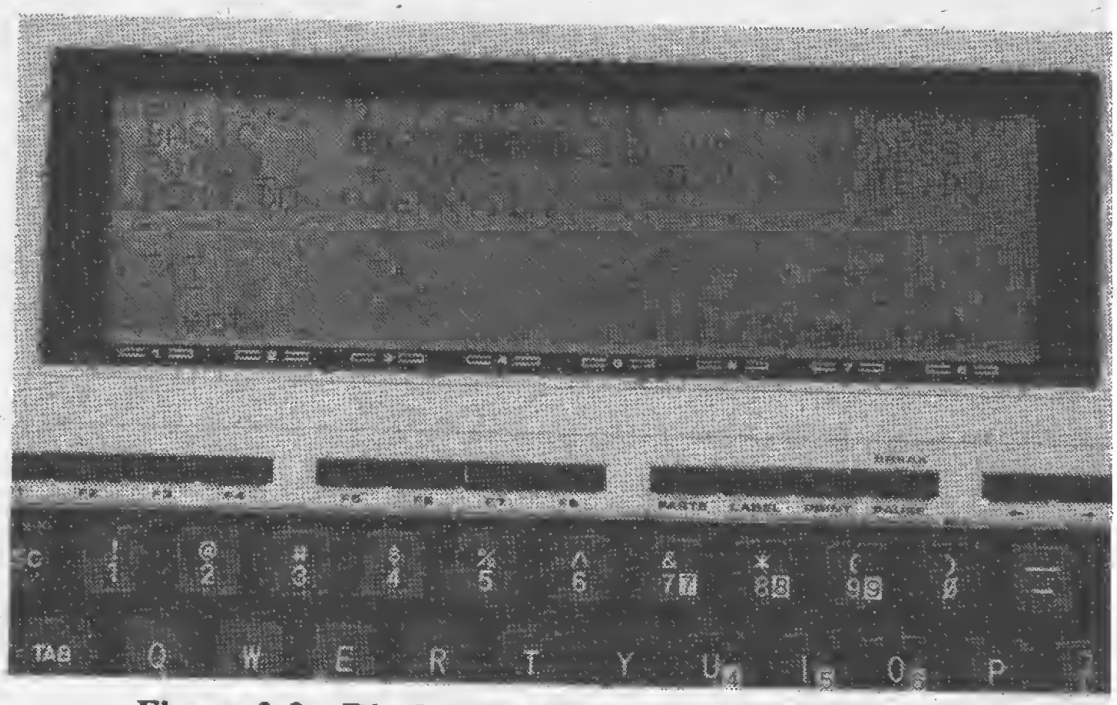


Figure 2.3 Display listing the names of five built-in programs with the cursor on *TEXT*.

File to edit?

The cursor will now be smaller and will appear right after this line. TEXT is asking whether you want to call up a document you have already typed, or whether you would like to begin a new document. If you want to call up an old document, type in the name of that document (*filename*). If you want to begin a new document, type in the name you wish that document to have and press ENTER.

You may give a document any name you wish, but filenames can be no longer than six characters. If you try to use a longer name, the computer will *beep* at you and ask you for the filename again. If you make an error while typing the name of your file, use the left arrow key to move the cursor back and retype the name.

After you have entered a filename, the screen will clear, and you will see only the cursor in the upper left part of the screen. A small arrow is embedded in the cursor to show you where the next letter you type will appear. You can now begin typing in text.

Adding or Deleting a Character at a Time

Editing, or making changes, is a pleasure with the Model 100. Let's say you accidentally typed *Niw* instead of *Now*. First, put the cursor on top of the *i* in *Niw*, using the arrow keys. Each time you press one of the arrow keys, the cursor will go one space in the direction indicated. Each of these keys also has a *repeat* function: if you hold an arrow down for more than about two seconds, the cursor will begin to move in the indicated direction until you release the key.

When you have the cursor on top of the *i* in *Niw*, hold down the SHIFT key and press the DEL BKSP key (top row of the regular keys, extreme right side). The *i* will be deleted, and the word will now be *Nw*. Now just type in an *o*, and the *o* will be inserted. This illustrates an important point about the edit feature of TEXT. If you press the DEL BKSP key without holding down the SHIFT key, the letter or space just to the left of the cursor will be deleted. It is impossible to type over the top of anything you have entered. If you position the cursor on top of a letter and type another letter, the original letter will be moved over one space and the new letter will be inserted. That seems strange at first, but it allows you to insert as much text as you want. Simply place the cursor at the spot where you want to add something and begin typing. Everything to the right of this spot will be moved over to make room for what you type. This is not the usual way word processing packages work, and if you're accustomed to another system, it takes some getting used to.

Another Way to Move the Cursor

So far, we've explained how to move the cursor with the arrow keys alone. That works fine at first, but you will soon wish there were a faster way to get the cursor where you want it to go. To help you do that, you can use the SHIFT key or

the CONTROL key along with the arrow keys. If you press down the SHIFT key and the right or left arrow key, the cursor will immediately jump to the beginning of the nearest word to the right or to the left. If you press down the CONTROL key (CTRL) and the right or left arrow key, the cursor will jump directly to the right or left end of the line. If you hold down the SHIFT key and press the up or down arrow key, the cursor will jump immediately to the top or bottom of the display while remaining in the same column. If you hold down the CONTROL key while you press the up or down arrow key, the cursor will jump immediately to the beginning or the end of the document.

There is another way to delete a letter rather than using SHIFT and the DEL BKSP keys. You can use the DEL BKSP key all by itself. If you do that, the character just to the left of the cursor will be erased, and the letter under the cursor will take its place.

Adding or Deleting by Using Blocks of Text

It is possible to add or delete text by marking off blocks of text. This is a little like using the *cut and paste* method of editing. You have probably done that in the past. First, you type up a rough draft. Then, you cut large sections out and throw them away or move them in one large block to another part of the text, pasting the new section in place.

Cut and paste editing can also be done electronically on your computer. To do that, you must first mark off a block of text by placing the cursor on top of the first character in the block. You then press the F7 function key, located in the row of small rectangular keys just above the number keys. The F7 key is the SELECT key. Next, use the arrow keys to move the cursor to the end of the text you want to mark. You can mark off a block of text as short as a single character or as long as several pages.

Any text you mark off will appear in *reverse video*. That means with light letters on a dark background, just the reverse of normal operation. When you have moved the cursor to the

end of the passage to be included in the block, you must press the CUT function key (F6) or the COPY function key (F5). If you press CUT, the passage will be removed from your text and stored in memory so that it can be pasted in later. If you press COPY, a copy of the passage will be stored in memory, and the original will be left in the text. It is important to remember that only one passage at a time can be stored in memory with the CUT key. Each time you press CUT, the computer forgets any previous passage and stores the new one.

If you want to get rid of the block permanently and not use it anywhere else, you don't have to do any more. If you want to move the block someplace else, you put the cursor where you want to insert the block of text. Then you press the PASTE function key. The block of text previously stored in memory will appear at the point your cursor was located. Text that followed the cursor's location will be moved down and will now appear just after the end of the text you moved.

The Function Keys

The function keys are the small rectangular keys just above the number keys on your keyboard. The first eight are numbered from F1 to F8. If you forget what any of these keys are for, you can press the key marked LABEL, and the bottom row of the display will show an abbreviation for each of the function keys. Numbers from 1 to 8 are printed on the console just below the display screen, corresponding to the function keys. *Sel* appears in the display just above the number 7 to remind you that it's the SELECT key. If these abbreviations distract you, press the LABEL key again, and they will disappear.

Using the FIND Key

Sometimes you need to find a certain place or a certain word in a file. It would be difficult to search the entire document,

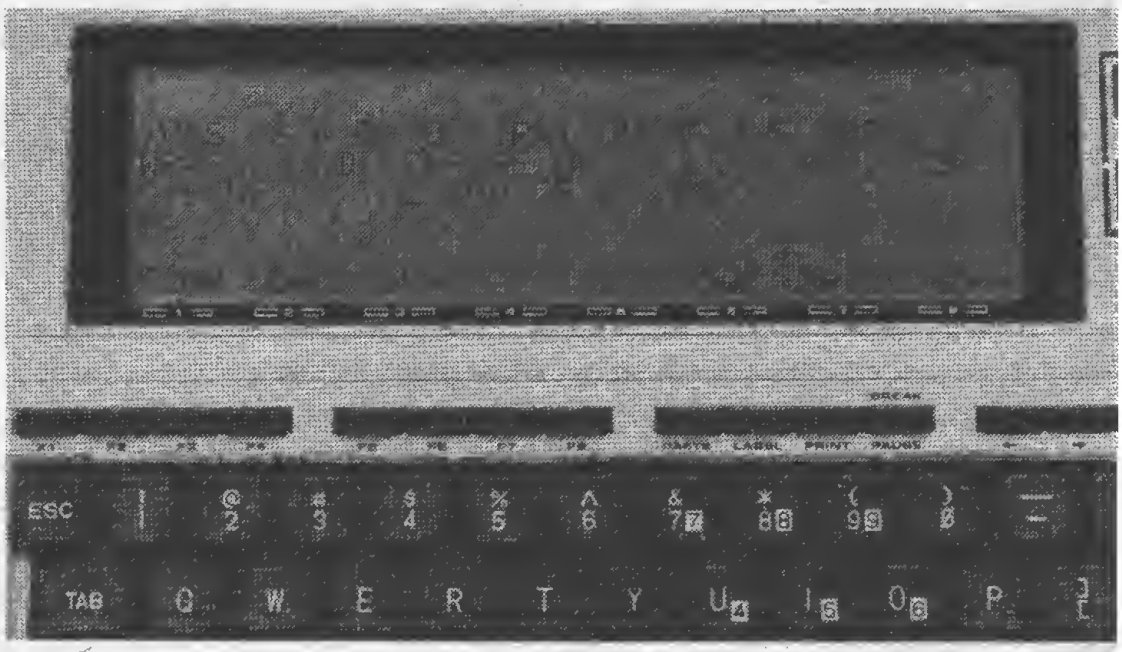


Figure 2.4 The bottom row of the display shows an abbreviation for each of the function keys.

especially a long one. The FIND key can help you with a task like this. Suppose you want to find the spot in the text beginning *Mr. Smith*. First use the arrow keys to position the cursor at the spot where you want to start searching, then press the FIND key (F1). The computer will display *String:*. You then type in *Mr. Smith* and press ENTER. The cursor will jump to the first place in the text where the words *Mr. Smith* occur. You may then make corrections or do any other editing you choose. If you want the cursor to jump to the next spot where *Mr. Smith* occurs, just press the FIND key again and then the ENTER key. You may continue doing this until you have located every spot in the text where the words *Mr. Smith* occur. The computer will then display *No match*.

One caution: if you ask the program to find a word like *the*, you may get a surprise. Not only will it find every *the* in the document, it will also locate the letters *t-h-e* even if they are part of a larger word. So the program will also find every *the*ir, every *the*se, every toge*the*r, and every other word containing those three letters! If you only want to find the word *the*, put a space before and after it. The Model 100 word processor, by the way, does not distinguish between upper- and lowercase

letters when it searches. You will find *The* as well as *the* by telling the computer to search for *the*.

After you type in the first search word, it will appear after *String:* when you press F1. If you want to search for a different word, just type it in; the computer will automatically erase the old word and replace it with the new one.

Loading and Saving Text

After you write something using TEXT on the Model 100, you may want to SAVE it. Then you can call it up later to edit or print it. Right now, the only way to save anything is to use a cassette recorder and save it on an audio cassette tape. Lots of people are wondering if Radio Shack is planning some sort of mini-disk drive for this computer. For now, you'll have to be happy with the cassette.

To save a text file on cassette tape, you need a good quality cassette recorder. Radio Shack has its own (26-1208), which sells for $59.95. Be sure the recorder is plugged into the wall socket or has good batteries. Also, be sure both the computer and the cassette recorder are turned off before you try to connect the two. You'll also need the Radio Shack recorder-to-computer cable to connect the two machines; this comes with the recorder.

The large round end of the cable plugs into the port labeled *cassette* on the back left side of the Model 100. The other end of the cable has three small plugs on it. All three of these plugs should be plugged into the recorder. The black plug should be plugged into the earphone jack, while the larger of the two gray plugs should be plugged into the jack marked *auxiliary*. The smaller gray plug goes into the jack marked *remote*. After you have made all these connections, push down the *play* and *record* buttons on the tape recorder. The recorder will not advance the tape at this time because it is controlled through the computer. Be sure the cassette tape is in the recorder and has been advanced past the lead-in. If it has not, you can unplug the smaller gray plug and advance the tape.

Getting the volume and tone controls set properly can be

tricky on some machines. We had no problems with the Model 100, however. We used a high-quality cassette tape and set the volume at about the halfway mark. Try the tone control turned all the way to the high end. If you have difficulty, you may have to experiment with different settings.

Turn on the Model 100 and move the cursor on top of a TEXT file you have already completed. All TEXT files will have *.DO* after their names. That is, if you name the file *DEMO*, the computer will name it *DEMO.DO*. The *.DO* is called an extension. Press ENTER. Now press the SAVE function key (key F3). The computer will display:

Save to:

Type in the filename you want for your text (no more than six letters) and press ENTER. The cassette tape will turn until the recorder has stored the text under the filename you typed in. Then the tape will stop and the filename you typed in will disappear from the screen. The file will then be stored on the tape.

The procedure is similar if you want to LOAD a file you have stored on a cassette tape. You connect the cassette recorder, turn on the Model 100, and put the cursor on top of the word TEXT. When you are prompted for the name of the file you wish to edit, type in a filename and press ENTER. Then press the LABEL key to display the guide for the function keys. Now press the LOAD function key (key F2). The computer screen will display:

Load from:

Now type in the exact name of the text. This is the name you gave to the file when you stored it on the cassette tape. Press ENTER. The cassette tape will begin to advance and the word *FOUND:* will be displayed, followed by the name of the text. You will then hear some high pitched noise. This is the sound of the text being transferred from the cassette tape to the computer memory. When the noise stops, the text will appear on the screen. You may then add to it or edit it as you please. If

you want any changes to be saved on the cassette tape, you must SAVE the document again.

Printing a TEXT Document

If you want to print a *TEXT* file, you will need a printer and a printer cable. We recommend any good parallel printer. Radio Shack would like to sell you one of their printers, like the Daisy Wheel II, the DWP-410, the DMP-400, or the DMP-500. They're all good printers, but you may be able to get a better deal on some other brand. Shop around a little before you decide. We also recommend you take your computer with you when you shop. Try printing something out before you plunk down any money. If the salesperson won't allow that, something may be fishy, and you should go somewhere else to spend your money.

When Radio Shack made the Model 100, they did not put a standard printer connector on it. So you will need to buy an adapter, or else buy the Radio Shack Model 100 Printer Cable ($14.95, part no. 26-1409). Be sure that the printer is correctly set up and loaded with paper. You will need to read the printer manual carefully. Then make certain that both the computer and the printer are turned off.

The large end of the printer cable should be connected to the printer. The smaller connector should be plugged into the printer port on the back of the computer. It is possible to plug this connector in upside down. To prevent this, be sure that the cable exits toward the bottom of the computer.

After the cable is installed, you may turn the computer and the printer on. You can choose to print out a complete document or only the part of a document that you can see on the computer display. If you want to print out the complete document, get the document on the screen. It won't matter where the cursor is positioned in the text. Hold down the SHIFT key, and then press the PRINT key. The computer will display:

```
Width?
```

The display will also show you the current width setting. The width refers to the length of each line on the printout. If the current width setting is what you want, press ENTER. If not, type in the width you want, and then press ENTER. Most people want lines that are 62 to 80 characters wide.

If you want to print out only what is on the screen, press only the PRINT key.

Unfortunately, it is not possible to set the margins on the Model 100. For example, if you wanted the computer to move over twenty spaces from the left margin before printing each line (so you can bind or staple the report), this word processor won't let you do that. However, some printers can be given directions to do that, using the CHR$C#) command in BASIC. Check the printer manual for information. That is what we were talking about when we said that the Model 100 had some printing limitations. In fact, it is not possible to do very sophisticated printouts with this portable computer. Again, there had to be some compromises.

If you plan to use the Model 100 extensively for word processing, you may want to get *PRINT*, a $50 program from Micro Computer Services. This program enhances the operation of the built-in word processing program and gives you control over the way material is printed. The same company has several other programs for the Model 100.

CHAPTER THREE

The Built-In Schedule and Address Packages

The next two built-in packages are the Schedule and Address Organizer packages. These packages are abbreviated SCHEDL and ADDRSS. Both programs are really special applications of the word processing package. Using them is similar to using the TEXT program.

THE SCHEDL PROGRAM

You can use SCHEDL to help keep track of your schedule, but you can also use it for record keeping of any kind. The Schedule Organizer simply gives you a quick and easy way to search a TEXT file for information. To use this program, you must first create a TEXT file called NOTE. Actually, the file will be named NOTE.DO, but the *.DO* will be added automatically by your computer. You'll remember that you create a TEXT file by turning the Model 100 on, positioning the cursor on top of the word TEXT, and pressing ENTER. Then, when the computer asks for the name of the file, you type NOTE and press ENTER.

The next thing you need to do is decide what records you want to keep in the Schedule Organizer. SCHEDL will permit you to type in a word or two as a *tickler* and will then display any entries containing the tickler word or characters. Any records that process would help are suitable for putting into SCHEDL.

If you decide to keep your schedule in this file, give some

thought to how you should organize the data. The following format would probably work well:

```
10/20—8:00 A.M.—Mr. Welton—Acme Machine—
      Room 243
10/20—10:00 A.M.—Mr. Butler—Acme Machine—
      Room 101
10/20—3:45 P.M.—Ms. Sowell—Turner Co. Lobby
10/20—5:00 P.M.—Ms. Sowell—Hillcrest Restaurant
10/20—8:30 P.M.—Call home
10/20—10:00 P.M.—Call Mr. Mehaffie
```

After you have entered the date, press ENTER and then return to the main menu by pressing function key F8.

Later, when you want to use the SCHEDL program, return to the menu. Then put the cursor on top of the word SCHEDL and press ENTER. You will see a display with *Schd*: at the top, and a reminder at the bottom of the screen that the F1 key is the *Find* key, the F5 key is the *Lfnd* key, and the F8 key is the *Menu* key. You can now use the function keys to help you find schedule information stored in the *NOTE.DO* file. Suppose you remember only that you have an appointment with Mr. Welton. You have forgotten the time, the place, or the date. Simply press *FIND* (F1), and the program will display *Find* after the word *Schd*:. You may now type in a keyword that is unique to your appointment with Welton and the program will find and display the entire entry. An easy way to do this is to type in the word *Welton* and press ENTER. If you do that, the Model 100 will display the entire Welton entry, reminding you of details you may have forgotten. *Lfnd* (F5) works exactly the same way, except that whatever is found is printed on the printer.

As another example, suppose you have forgotten who you are supposed to meet at Acme Machine. If you press F1 and then type in *Acme* and press ENTER, the computer will display all the information about your meeting with Mr. Butler, as well as the one with Ms. Sowell.

If you have forgotten the details of your dinner arrangement but remember that you entered the name of a restaurant, you

can press F1, type *Rest* and press ENTER. The computer displays the entire entry concerning your dinner appointment at the Hillcrest Restaurant. If you typed in *10/20*, you would be shown your entire schedule for that day. If you typed in *pm*, you would be shown only your afternoon schedule. If you typed in *10 am*, the computer would display only the information about your appointment with Butler.

By now you may have figured out how this program works. The computer searches its memory until it finds every entry containing the characters you type in after pressing F1, then displays them.

Rather than using this program for a schedule, you might choose to enter other data. If you coach a Little League team, for instance, you might enter the names of all the players on both teams, along with their batting averages. As each player comes to bat, you can enter his or her first name as a tickler. Then you might devise a simple code to enter beside each batter's name to show how he does at bat. You might use a 1 for hit, a 2 for walk, and a 3 for strike-out. You can devise another code for performance in the field.

Whenever you need to see that data, you can press F1 and type in a child's name. If you want to see the names of everyone who got a hit, you just press F1 followed by 1. Every name with a 1 beside it will be displayed. Just be careful to choose codes which can represent only one thing. For example, the system we have explained using 1, 2, and 3 will not work if you also enter the players' uniform numbers. If so, when you tell the computer to find every entry with a 1 in it you'll get some strange results. You are interested in finding out who got a hit. The computer has no way of knowing that and will display everyone who got a hit *and* everyone whose uniform number has a 1 in it!

Of course, you could change your code system and use * for a hit, & for walk, and # for strike-out. It takes a little planning to avoid problems in a code system.

You can print out whatever is on the screen by pressing the PRINT function key. You can use the PASTE key to insert anything you have previously CUT or COPYed while in any TEXT file. If the display is longer than six lines, the words

MORE and QUIT will appear at the bottom of the display. To see the rest of the display, press MORE (F3). If you have seen all you want to see and need to search for something else, press QUIT (F4). You will use QUIT and MORE if you want to see everything in the NOTE file. To do that, press F1 and then press ENTER. The display will show the entire file, six lines at a time.

THE ADDRSS PROGRAM

The Address Organizer (abbreviated ADDRSS) is another program built in to the TRS-80 Model 100. First you must create a TEXT file, which must be called ADRS. The program will automatically add .DO to the name. Therefore, when you see it in the Model 100 menu, it will be listed as ADRS.DO.

As we explained earlier, the way to create a TEXT file is to turn on the Model 100 and position the cursor on the word TEXT in the main menu. When the computer asks for the name of the file, type ADRS and press ENTER. You can then enter data.

This file can be used to help you keep track of addresses and phone numbers, but it also has another important use. It can be used by the TELCOM program to dial telephone numbers automatically. We'll explain how to do that in a later chapter.

Like the Schedule Organizer, this built-in program can be used for keeping many different types of records. The program is intended to give you a quick and easy way to search a TEXT file for information.

Whatever information you decide to use this file for, you should give a little thought to how you will organize your entries. If you decide to use it for addresses and telephone numbers, a format like the following would work well.

Irons, Tom. 3318 W. 15th, Chicago, IL :418-513-2461:.
Murphy, Dick. 24 S. 3rd, Phoenix, AZ :602-413-1163:.

Paris, Jan. 6 W. 83rd, Lubbock, TX :806-792-1666:.
Morris, Martha, 15 W. 9th, Chicago, IL :418-615-8831:

You may put in as many entries as you want until you run out of data or until your computer runs out of memory. The colons in the above entries are very important and must be included if you will be using the ADRS file for automatic dialing with the built-in TELCOM package. They are needed because when TELCOM is used to dial telephone numbers, it begins reading the telephone number just after the first colon and stops reading the number just before the second colon. Always press ENTER at the end of each entry.

After all entries are completed, simply press the F8 function key to return to the main Model 100 menu. To search the file you just created, position the cursor on top of the word ADDRSS in the menu. Then press ENTER. *Adrs:* will be displayed in the upper left corner of your screen. Now look at the bottom line of the display. This line shows the labels for the function keys. The F1 key is the *Find* key, the F5 key is the *Lfnd* key, and the F8 key is the *Menu* key. If you want to find an address, press F1. Then type in a tickler, just as you would when using the Schedule Organizer.

Here's an example. Suppose you want to know what Tom Iron's, telephone number is. Type in the tickler word *Tom* and press ENTER. Don't worry about capitalizing the first letter of his name. The search will find *Tom* whether you enter upper- or lowercase letters. Suppose you know that you should call the man in Chicago, but you have forgotten his name. After you press F1, type *Chicago* and press ENTER. All addresses in Chicago will be displayed. If all you can remember is that someone you need to call is on 83rd, press F1 and type in *83rd* and press ENTER. The screen will display every address on 83rd. This wouldn't work well if you typed in *83* instead of *83rd*. If you did that, the program would display the address on 83rd, but it would also display every entry with a telephone number containing the numbers 83. You have to choose your tickler words with care.

The *Lfnd* (F5) key works just like the *Find* key (F1), except whatever is found is printed out on your printer.

You can also use the PASTE function key to put anything into the file which you have previously CUT or COPYed. Pressing LABEL always displays a reminder of what the function keys do. PRINT will get you a printout of whatever you have on the screen. If you want a printout of the entire file, press F8 to return to the main menu. Then put the cursor on top of the word ADRS.DO and press ENTER. Then hold down the SHIFT key and press ENTER.

Just as with the Schedule Organizer, you can make up a code system to use with the Address Organizer. Of course, you can also elect to use the ADRS file for information other than addresses. It's really best to use this file for addresses and telephone numbers, though, at least if you plan to use TELCOM and want to have the computer dial numbers for you.

CHAPTER FOUR

Making the Model 100 Talk with the Model 4

This chapter is about making two computers talk to each other. Why would anyone want to do that? Suppose you go on an out-of-town business trip and use the built-in word processing program in your Model 100 to take notes at an important meeting. The meeting is a long one, and the notes are lengthy. That night in your hotel room, you use the computer to compose a report for the boss. Everything's great now, except that your report was lengthy and completely filled up the memory on your Model 100. After all, the machine is a portable and comes with as little as 8K of RAM.

TIME OUT FOR ANOTHER SMALL DOSE OF JARGON!

Before we go any farther, we're going to have to pause for a moment to explain that last sentence. One thing we've attempted to do in this book is avoid using too much computer jargon. We'll continue with that policy, but the topic of memory is a very important one. So we're going to take just a few paragraphs to review some concepts we covered in Chapter One and to explain computer memory in a little more detail.

The amount of memory a computer has determines how much data can be stored in it. "That's reasonable," you say, "but what's all this about Ks and *bytes*?"

When we talk about computer memory, K is simply an abbreviation for 1024. So right away you know that if you buy

the Model 100 with 8K bytes of memory, it will store 8192 *bytes* (whatever those are). A *byte* is an eight-digit number that contains only ones or zeros. (Believe it or not, half a byte is called a *nibble*!) Why would you want to store such numbers? Because unfortunately your computer doesn't speak English. So whenever you type in a letter, the computer must turn it into something it can understand. Computers can understand eight-digit numbers containing only ones and zeros: computers understand *bytes*. It takes one byte to represent any character you type in, including letters, numbers, blank spaces, and so on.

That should mean that if you have a Model 100 with 8K bytes of memory, you can type in and store 8000 characters, including spaces, right? Not really. Actually, you can't store that much, because some memory is taken up with things the computer needs in order to operate correctly. What you actually have left will store closer to 5K bytes.

A little arithmetic will convince you that five thousand char-

Figure 4.1 The TRS-80 Model 100 and the Model 4 computers

acters isn't really that much! If you print sixty characters to a line, that works out to just a little over 83 lines of text. Depending on print size, you can get about 26 lines on a standard typewriter page. That means that even if you have nothing else stored in the computer, you can store only about three pages of text in your Model 100, and then you'll run out of memory! For that reason, we recommend that you expand the memory when you buy the machine.

The Model 100 can be purchased with 8, 16, 24, or 32K bytes of memory. When this book went to press, the cost of the 8K version was around $800, and each additional 8K bytes cost $135, including installation. How much memory you purchase depends on your needs and your pocketbook. We think the standard 8K is so limited that you should get at least 16K.

With a memory of 32K you can store about eighteen or nineteen pages of text. You may never need that much, but don't forget that some memory will probably be taken up by files you are using with the other built-in software packages. If you store any data using the Address Organizer and the Schedule Organizer programs, that will subtract from the total amount of memory you can use to store files created for word processing. If you store any BASIC files, that will further subtract from the memory. We think 32K would be about right for most people.

TIME IN AGAIN

So much for computer jargon. Back to our example. You return from your business trip with the Model 100 clutched tightly under your arm. The memory is full. There's another important meeting beginning thirty minutes after you arrive. You need your computer to take more notes with. What do you do?

Actually, there are several things you could do. You could print your report out on paper, erase it from the Model 100's memory, and then you would have room to put in more notes. That might not work well, though. We've already explained

that the Model 100 doesn't give you much control over what a printout will look like. You can set the length of each line from 1 to 132 characters and that's about it. If you want your report printed with specific margins, with some lines double-spaced and some single-spaced, or if you have other special requirements, you're probably out of luck.

You could print out the report and have your secretary type it over again on a typewriter or on a more sophisticated word processor, but that would be costly and time consuming.

A better alternative would be to transfer the text directly from the Model 100 into the TRS-80 Model 4 your secretary uses for word processing. Then your secretary could call the text up in the sophisticated word processing package he or she uses and set up the text to be printed out as you want it. It is possible to do that, and that is what this chapter is about. Sending data from the Model 100 to the Model 4 is called *uploading* data.

UPLOADING FROM THE MODEL 100 TO THE MODEL 4

Uploading from the Model 100 to the Model 4 is not difficult, but there are several cumbersome steps involved. We'll give you a step-by-step description of what to do. You can use these instructions whenever you need to upload data. There are quite a few steps in this precedure, and we're sure someone will eventually write a program that will make it much easier to do. Keep your eyes open for ads in the computer magazines or check with your local Radio Shack dealer. In the meantime, here goes.

Equipment You Will Need

You will need to buy some special equipment. All of it is available from your local Radio Shack dealer. First, you will

need a standard RS-232C Cable. The Radio Shack part number is 26-4403, and the price is $39.95. One end of this cable must be attached to the serial connector on the bottom of the Model 4. You will also need a Null Modem Adapter (26-1496—$29.95). One end of this adapter will plug into the end of the RS-232C Cable coming from the Model 4. You will then need to plug the other end of this adapter into one end of the eight-inch Cable Extender (26-1495—$29.95). The other end of the Cable Extender plugs into the RS-232C connector on the back of the Model 100.

That probably sounds complicated, so let's list the order of the equipment starting at the Model 4 and going on to the Model 100:

- Model 4 Computer
- RS-232C Cable
- Null Modem Adapter
- Eight-Inch Cable Extender
- Model 100 Computer

Model 100 Instructions: Part One

These are instructions for uploading document files (files with .DO after the name on the menu). Instructions for using BASIC files are in Model 100 Part Two.

The next thing to do is to get the Model 100 set up so that it can talk to the Model 4. Turn the Model 100 on, place the cursor on TELCOM and press ENTER. The top line of the display will list some numbers and letters, which determine what form the data will be in when it is sent from the Model 100 to the Model 4. The data must be in a form the Model 4 can understand. This top line must read *37E1D, 10 pps*. If that is what is displayed, you can skip the rest of this paragraph and press the F4 key to turn the Model 100 into a terminal for sending or receiving data. If the top line displays different numbers, press F3. The display will prompt you with the word

Stat. Now type in *37E1D, 10 pps* and press ENTER. Then press F4 to turn the Model 100 into a terminal. The labels on the bottom line of the display should be as follows: *Prev* should be displayed above F1, *Down* should be displayed above F2, *Up* should be displayed above F3, and *Full* should be displayed above F4. The meanings of these keys are discussed in your Model 100 manual.

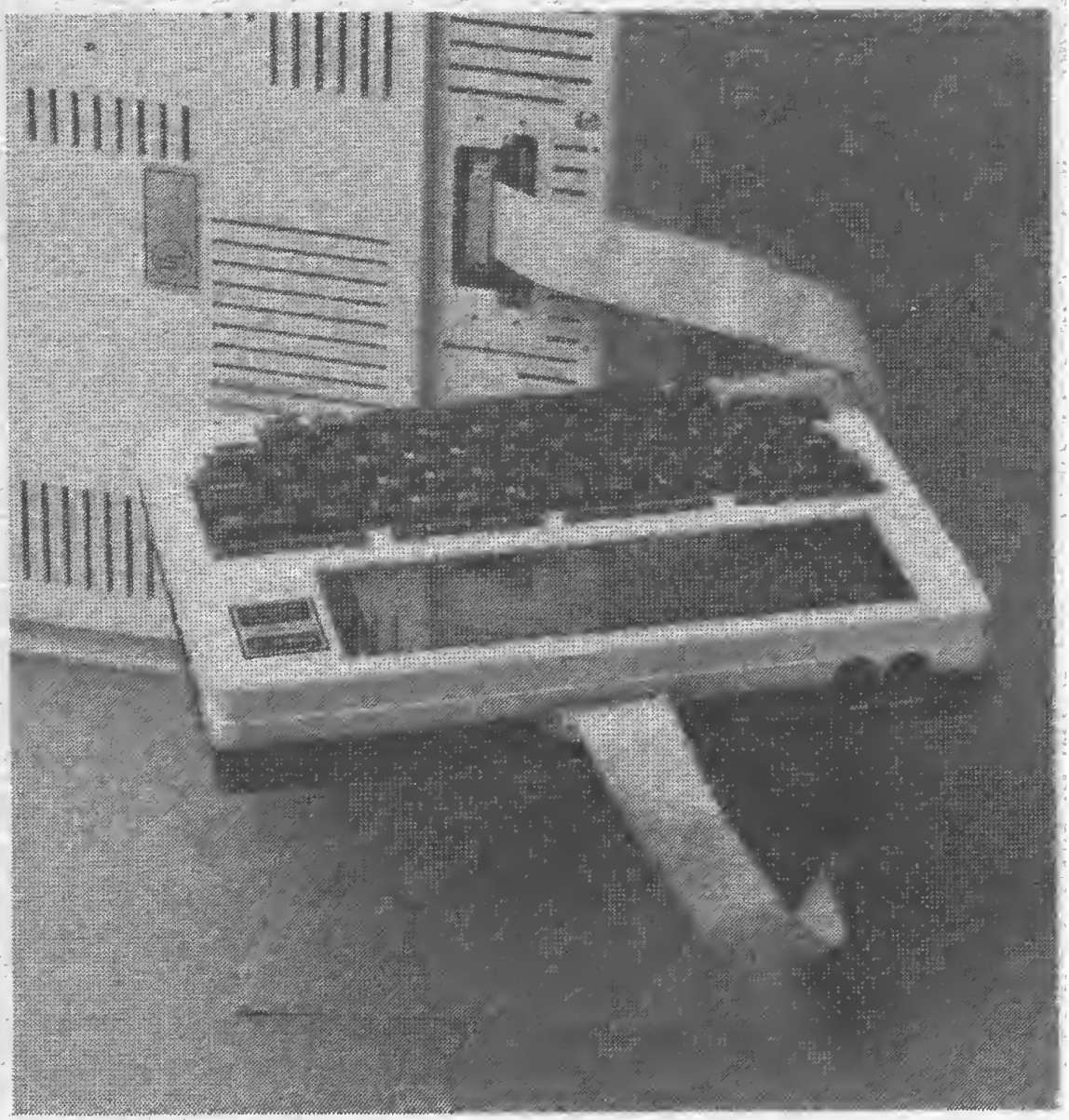


Figure 4.2 Two computers will talk to each other once the proper equipment is attached.

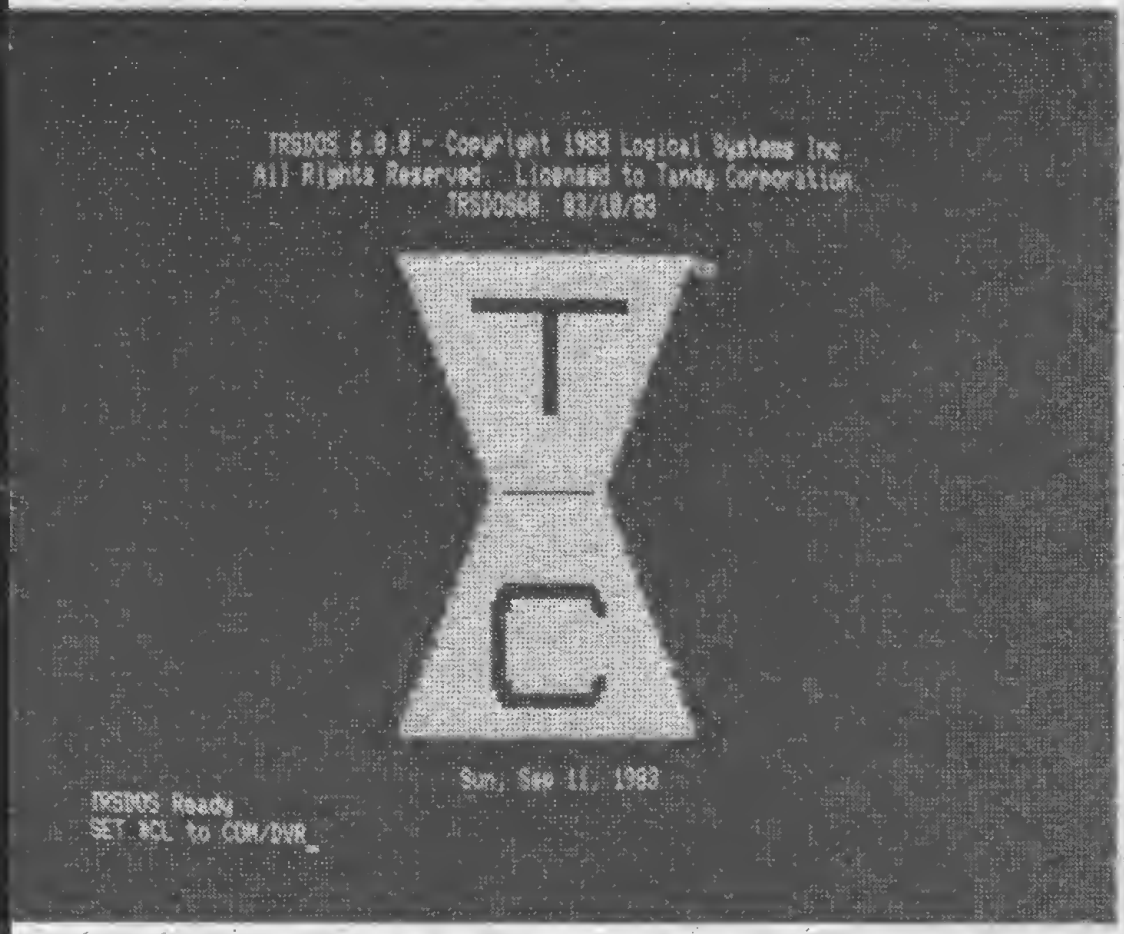


Figure 4.3 These instructions tell the program to use the RS-232 port on the Model 4.

Model 4 Instructions: Part One

Now you need to set up the Model 4. Turn the computer on and insert the TRSDOS disk that came with the computer. This is TRSDOS version 6.0. Put the disk in the bottom disk drive with the notch in the disk on the same side as the small red light on the drive. Press the orange reset button on the right side of the Model 4 keyboard. TRSDOS will prompt you for the date. Type it in, using two digits for each number (for instance, 06/22/84), and press ENTER. If you do this correctly, *TRSDOS Ready* will be displayed. If you have problems getting this far, consult your Model 4 manual.

Now do the following:

1. Type *SET *CL to COM/DVR* and press ENTER. (Upper-

or lowercase letters can be used.) This gets a program that will allow the two computers to communicate and tells the program you will be using the RS-232 port on the Model 4.

2. The TRSDOS copyright information will be displayed and after that:

COM driver is now resident
TRSDOS Ready

3. Now type:

SETCOM(BAUD = 300,WORD = 7, STOP = 1, PARITY = YES,DTR = ON,RTS = ON)

Then press ENTER. You will again be shown the *TRSDOS Ready* display. This command tells the communication program what form the data will be in when it arrives.

4. Type *COMM *CL* and press ENTER. The display will

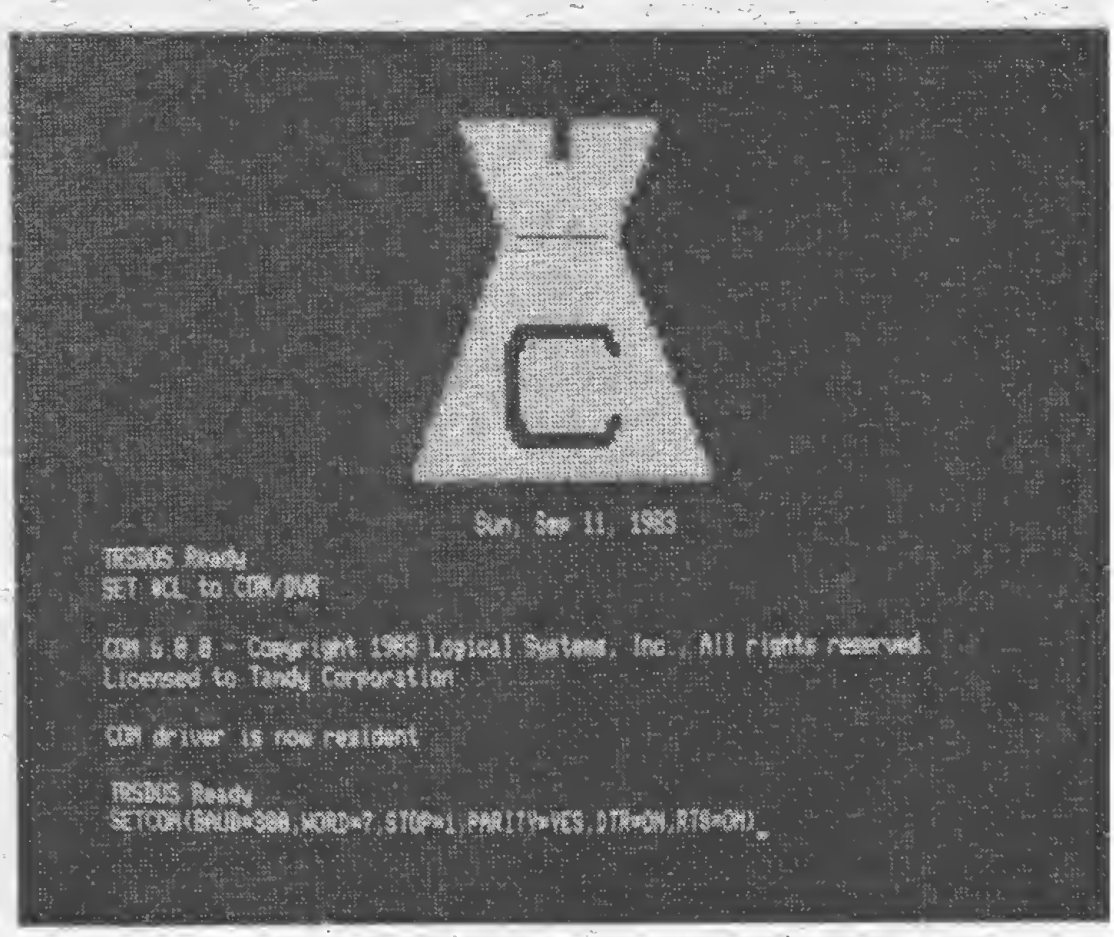


Figure 4.4 TRSDOS copyright information is displayed.

show *Use < CLEAR-8 > for Menu*. This command gets another program needed for the data transfer.

5. Hold down the CLEAR key and briefly strike the 8 key. You will then see a line of numbers from 0 through 9 as well as a : (colon) and a - (hyphen) displayed across the bottom of the screen. Various abbreviations for each number will also be displayed. If you are interested in what these abbreviations mean, consult your Model 4 manual.

6. Hold down the CLEAR key while you briefly strike the 6 key. Release both keys. Then hold down the CLEAR key while you briefly strike the 9 key. The prompt *Filename:* will be displayed.

7. Now type in the name you want the file to have once it is transferred from the Model 100 into the Model 4. This name does not have to be the same name that the file currently has in the Model 100. If you want to store the file on a disk in drive 0, after typing the new name for the file, press ENTER. (If you want the file transferred to a disk in drive 0, that's all you need do. If you want it transferred to a disk in drive 1, type a space, followed by a colon and the number 1 after you type in the new filename.)

8. The drive on the Model 4 will run for a few seconds and then stop. There will be a flashing cursor on the Model 4 display. Now hold down the CLEAR key while you briefly strike the 6 key. Release both keys and then hold down the CLEAR key while you strike the key with the colon on it. Nothing will happen at this point.

Model 100 Instructions: Part Two

Here is the second set of instructions for the Model 100.

1. Be sure you have followed the first set of instructions for the Model 100. If you haven't, go back and follow those instructions now. Then push the F3 (Up) key on the Model 100. The display will prompt *File to Upload?*.

2. Now type in the name of the file stored in the Model 100 which you wish to send to the Model 4 and press ENTER. The display will prompt *Width:*.

3. If you wish to specify the width of the lines to be sent, you may type in a number between 10 and 132 and press ENTER. If you want the file to go "as is," simply press ENTER. The Model 100 will then send the file to the Model 4, and you will be able to see the contents of the file on the Model 4 display. Do nothing until the file has been transferred.

Model 4 Instructions: Part Two

Now go to the Model 4, hold down the CLEAR key and push the 6 key one time. Release both keys, then hold down the CLEAR key and push the 0 key one time. This tells the Model 4 that no more data is coming from the Model 100.

You will find that the file from the Model 100 has been stored on the disk in the Model 4. You can then enter your Model 4 word processing system and call up that file. You can edit it, add to it, print it out, or do anything else your Model 4 software allows you to do.

DOWNLOADING FROM THE MODEL 4 TO THE MODEL 100

You can also send data from the Model 4 to the Model 100, although you probably won't want to do it very often. You will probably use the uploading procedure much more frequently, since you can fill the Model 100 memory, upload to the Model 4, and head out the door with your Model 100, ready to fill up the memory once again.

The Special Case of BASIC Files

Most of the programs you want to transfer from the Model 100 to the Model 4 are likely to be document files. That is, usually they will be files you have used with the scheduling,

word processing, or spreadsheet programs. There may be times, however, that you have a file written in BASIC on the Model 100 that you would like to upload to the Model 4. For example, you may have written a program to analyze computer stocks according to the microprocessor chip and amount of memory in each brand. Now you want to upload it to the Model 4 to enter about 75 companies and their financial histories. As it stands, however, the BASIC file can't be uploaded. It must be converted to a document file. Fortunately, this is an easy two-step process. First, press the SAVE (F3) key. The prompt:

Save to:

appears. In response, type the following:

"FILENAME",A

where FILENAME is what you want to call the file. Press RETURN. This instruction tells the Model 100 to store your file in ASCII format (all document files are stored in ASCII). When you display the menu, notice that the file now has the extender .DO after the name. With this indication that the file has been converted to a document file, you can now use the instructions for uploading.

The procedure for downloading is beyond the scope of this book. Consult your Model 4 manual or talk to your local Radio Shack dealer if you are interested. Also, be sure to watch the computer magazine ads, since someone will probably write and sell a program to make this complicated procedure much easier.

CHAPTER FIVE

Programming

The TRS-80 Model 100 is a unique computer designed to be used in situations where it would be impractical to take a larger computer. In spite of its portability, its special liquid crystal display, and its memory that doesn't forget when you turn it off, the Model 100 is still built on the same basic principles as any other personal computer and can be used in much the same way. One common use of all personal computers is for writing your own computer programs. In this chapter, we will tell you what computer programming is, how programs are developed, and about computer languages.

At present, the Model 100 can be programmed in only one language, BASIC. Nevertheless, because other languages will soon be available for this computer, we will tell you about some of them. In the next two chapters, we will give you some details on how to program in BASIC and on how to get the Model 100 to run BASIC programs.

As you read this book or any other book on computers, or even if you've never read about computers, you've probably heard the word *program* mentioned in relation to computers. Although the word is in common use, many people do not know exactly what a computer program is.

WHAT DOES PROGRAMMING HAVE TO DO WITH USING A COMPUTER?

Your TRS-80 Model 100 computer, and every other computer for that matter, can only do what it is told to do. The

computer, with all its parts in order, is still just a tool waiting to be used. Before it can do anything, it has to be told what to do. The process of telling the computer what to do is called *programming*. To put it more precisely, without a program, your computer is a useless collection of parts.

What Is a Computer Program?

If you want another person in the room to pick up a book and bring it to you, you either have to tell the person or in some way give the person instructions. You might say, "Please bring me that book." As long as the other person understands what you want and is willing, your instructions will be carried out. The instructions "Please bring me that book" tell the person what you want done. They are in the English language, and they are a complete set of instructions for a particular task. If you were talking to a computer instead of a person, the instructions might be called *commands* or *statements*, the complete set of instructions for a particular task would be called a *program*, and the language of instruction might be BASIC instead of English. *A computer program is really just a set of instructions*. It is your way of telling the computer what to do.

Where Do Computer Programs Come From?

When you switch the Model 100 on, it begins to talk to you by displaying its menu of built-in programs and asking which one you want to use. These programs were developed by programmers at Microsoft, a major software development company, and built into the electronic circuitry of the computer. These built-in programs cannot be changed. You can buy additional programs and can often change them to fit your own needs. In some cases, you may want to develop a set of instructions yourself and give them to your computer. When you do this, *you are writing your own program.*

Who Writes Computer Programs?

Not so long ago, only a few highly skilled, specially trained people wrote programs. This has changed. Millions of people know how to write programs, and thousands more are learning every month. Even very young children program computers today. No, this isn't necessarily because people have gotten smarter. It's because computers have become much easier to program.

There are different levels of programming, however, and some levels or types are easier to master than others. The people who did the built-in programming for your computer are highly skilled. They understand electronics and how computers work. Other professional programmers may not know a lot about the inner workings of the computer but make their living writing programs that make computers do things people want. These programs are called *applications software*. Thanks to these professional programmers, you don't have to write a program to tell your computer everything you want it to do; you can use applications programs other people have written.

Should You Learn to Program?

You can enjoy your TRS-80 Model 100 computer and have it do a lot of work without ever learning how to program. As you know, there are four programs already in the memory of the Model 100. These four programs make it possible for you to keep track of your schedule, organize an extensive address system, talk to other computers, and do word processing. A growing number of applications programs for the Model 100 can be purchased on tape and loaded into the computer's memory. Because the Model 100 has built-in programs and many applications programs are or will be available, many people will never write a single program. However, many owners

enjoy learning how to program the computer themselves. Learning to program has some advantages.

- *Added enjoyment*. It's fun to be able to give the computer your own instructions and have it understand and follow them.
- *Special uses*. Often with a new computer like the Model 100, there just won't be any software available that will do what you want your computer to do. If you gain some skill in programming, you can write some of your own programs.
- *Understanding software*. A person who knows something about programming is sometimes in a better position to select and use appropriate software. This depends on how much the person knows about programming and the nature of the software.
- *Modifying software*. Sometimes software will do almost what you want, but not quite. If you know enough about programming, you may be able to modify the software to get it to do what you want.

How are Computer Programs Written?

To write a computer program, you have to have some means of communicating with the computer. You must give the computer a set of directions in a language it understands, a computer language. Computers are programmed in over 150 different computer languages.

You'll need to know one of these to program your computer. The Model 100 has one computer language ready to use at any time. This language is BASIC, a very common language with many advantages for a computer like the Model 100.

How Much Do You Need to Know to Program Your Computer?

Learning a computer language is similar to learning a foreign language. If you were suddenly transported to a foreign country

where you didn't understand a word of the language, you would be helpless at first. However, in a very short time you would learn a few words of the new language and begin making some of your wants and needs known. Learning the new language would be a gradual process. As you worked and practiced, you would learn more and more new words and phrases until one day you might find yourself quite good at speaking the language.

The same is true for learning a computer language. You don't need to know very much to get started. For example, a five-year-old child can learn enough about programming in some computer languages in about ten minutes to tell the computer how to draw pictures on the screen. The more you practice and the longer you persist, the better you will become at writing programs.

COMPUTER LANGUAGES

Why are there so many different computer languages? The most obvious answer to this question is that different languages are needed to do different tasks. Computer languages can be thought of as tools used to make a computer do things. Just as you would use a hammer to drive a nail and a saw to cut a board, computer programmers use different languages to accomplish different tasks. In addition, the level of sophistication and experience of the programmer is a factor in computer languages. Most of us have enough experience to use an ordinary hand saw but not the fifty other types of specialized saws that do a particular type of job better than a hand saw. You need more experience and training to operate them properly. Computer languages also come in easy-to-learn versions and in more difficult, but specialized, versions that do particular types of jobs well.

High-Level and Low-Level Languages

There are two basic families of computer languages: high-level and low-level. High-level languages are the easiest to learn.

Whether a language is considered high-level or low-level depends on how far it separates the programmer from the internal workings of the computer. The lowest-level language is called machine language. The problem with machine language is that, while it is easy for the computer to understand, it is very hard for you and me to understand. Therefore, high-level languages have been developed to allow you to talk to the computer with words that are quite close to the words we use in everyday English. One of these high-level languages is BASIC.

Programming in machine language is not easy. In fact, it is very, very tedious. There are no words or even letters involved in this language and you must learn one or two new number systems (binary and hexadecimal) to write machine language programs. Other languages have been developed that are much easier for you to understand that use English or English-like words instead of just numbers. But before the computer can understand a program in BASIC, it has to be translated into machine language by a program called a BASIC *interpreter*, which is in the Read Only Memory of the Model 100. Sometimes the language you are working in is translated several times before it gets back to machine language. With languages like BASIC, you, as the programmer, are far removed from dealing with basic circuits of the computer. These languages are therefore called high-level languages.

BASIC

BASIC stands for Beginners All-purpose Symbolic Instruction Code. It's the most popular programming language in use today, especially with small computers like the TRS-80 Model

100. This high-level general-purpose language can be used for almost any type of programming and is many times easier to learn and use than low-level languages like machine language. BASIC uses English and English-like words instead of numbers. For example, if you want the computer to put a greeting on the computer display you could tell it to PRINT "HELLO HOW ARE YOU?" The word PRINT is a *keyword* in BASIC because the computer understands it and knows you are telling it to put the material in quotations on the screen.

Why Do We Need BASIC?

Two aspects of BASIC have made it so popular. First, it is a general-purpose language and can be used quite efficiently for many programming jobs. Second, it is a high-level language and is easy to learn. Even if the Model 100 could be programmed in a variety of languages, BASIC is a good place to start. The advantages of BASIC as your first language are:

- Every other brand of home computer can be programmed in BASIC. Even though the dialects are slightly different, you can easily adjust your programming skills to another computer. The Model 100 uses a version of Microsoft BASIC, and you can easily transfer what you learn on it to other popular personal computers such as the ATARI, Apple, Commodore 64, and IBM PC, since they (and many others) use Microsoft BASICs.
- Since so many programs are written in BASIC, you can adopt and adapt programs for your own use.
- Since it is one of the easiest languages to learn, you can probably do more with less learning time and effort than with any other language.

Unfortunately, there are many different versions of each computer language, including BASIC. Just as there are many different dialects of French or English, there are also many different dialects of BASIC. Each computer is at least slightly different from others, and manufacturers want the BASIC their machine uses to fit the machine's particular strengths and talents. In ad-

dition, some differences in various versions of BASIC reflect the personality traits and preferences of the programmers who wrote the BASIC interpreter.

TRS-80 Model 100 BASIC

Early Radio Shack computers used a dialect of BASIC called *TRS Level I BASIC*. This first version of the Radio Shack dialect has been expanded and updated to become more powerful and easier to use as Radio Shack has developed new computers. The Model 100 version of BASIC, like all the other Radio Shack versions except the Level I BASIC for the Model I, were created by Microsoft.

The Model 100 version is ready for you to use when you turn on the Model 100 computer. It is a complete and advanced version of BASIC. Model 100 BASIC is a type of BASIC that is sometimes called an *interpreter* language. An interpreter language translates each instruction in a program into machine language as the program runs. If the computer finds an error or a problem with the program, it will stop and tell you. You can then fix the error and tell the computer to run the program again. Not all versions of BASIC are interpreters. Some are *compilers*. In a compiled language, the entire program is translated into machine language and stored for later use. With compilers, if there is an error in your program, the process of finding and correcting the error is much more complex and time-consuming. Compiler versions of BASIC create machine language programs that run much faster than programs written in interpreter BASICs, but compilers are harder to learn and use.

Assembly Language

Because programming in machine language is so difficult, early computer scientists developed assembly language. Though not as easy to use as the higher-level languages like BASIC, it is much easier to use than machine language. Assembly

languages use letters of the alphabet as codes for different instructions. The advantage of this to the programmer is that the program is much easier to understand, and the codes are much easier to remember and use.

Your Model 100 computer is not ready to be programmed in assembly language when you turn it on. To program most computers in assembly language, you need to buy a software package called an *editor/assembler*. At present there are no editor/assembler programs for the Model 100, but several should be available by the time you read this chapter.

When you write programs in assembly language, you are only one step removed from the language the computer really understands, machine language. When you tell the computer to carry out instructions in assembly language, a program called an assembler translates your instructions into machine language so the computer can carry them out.

Although programming in assembly language is quite complicated and tedious, it has several advantages, if you want to spend the time it takes to become familiar with it. Probably the greatest advantage is speed. Although your computer can do things very quickly compared with how fast you or I can, sometimes a little additional speed is needed. Programs written in assembly language can do things much faster than programs written in high-level languages like BASIC.

Another advantage of an assembly language is that you can get the computer to do things that are difficult or impossible in other languages. In assembly language, you have virtually total control over the computer. The only limits to what you can do are limits set by the engineering of the computer. In high-level languages, you are confined not only to the engineering limits of the machine, but also to limits built into the language you are using.

Once you understand assembly and machine languages, you can use your knowledge in two ways. First, when you need a program that would be difficult or awkward to write in a high-level language like BASIC, you can write the program in assembly language using an editor/assembler program. Second, rather than writing a whole program in assembly language,

you can write a short program that does just one or two things, then incorporate it into a BASIC program. No single language is called machine language or assembly language. Each computer has a particular central processing unit, or CPU. The CPU, or *computer on a chip*, used by the computer determines the machine and assembly languages the computer can use. The TRS-80 Model 4 uses a Z80 CPU and thus speaks Z80 machine language and Z80 assembly language. The Apple, ATARI, and Commodore computers use one of the CPU's in the 6502 family and speak 6502 machine and assembly language. The Model 100 uses the 80C85 CPU.

Other High-Level Languages

Pascal

Another high-level general-purpose language that will probably be available for the Model 100 is Pascal. While it is easier to learn than assembly language, it is more complicated than BASIC. Pascal has three main advantages:

- It is faster than other high-level languages.
- Because of the way Pascal is structured, you can write a program that is very easy for another programmer who knows Pascal to understand.
- Because of its speed and versatility, Pascal is a more efficient language for some complex business and scientific uses than BASIC.

PILOT

PILOT is short for Programmed Inquiry Learning or Teaching. This is a specialized high-level language which, as the name suggests, was designed to be used in education.

Although enthusiasts of specialized high-level languages like PILOT claim they are suited to many general-purpose programming tasks, they are becoming popular primarily be-

cause they are highly suited to special applications such as use in schools. PILOT is a good language for people who want to write educational programs, and it is easy to learn to use.

Other Languages

Other languages are available for personal computers. Both FORTRAN and COBOL are popular languages on large computers and are used on some personal computers. FORTRAN is short for FORmula TRANslation and is used in many universities for work in research. COBOL is short for COmmon Business Oriented Language and is used in business and banking. These languages have been in use for a long time, but they are declining because newer, more efficient languages are available. FORTRAN and COBOL are not likely to be available for the Model 100, but other languages like Pascal that can be programmed to do the same type of work should be available soon.

Programs make the computer work for you. When you can't get software that will do what you want your computer to do, you may want to write a program yourself. To program a computer, you need to know a programming language. At present, the only language the Model 100 understands is BASIC. Other languages should be available for the computer by the time you read this, however.

CHAPTER SIX

Some Basics of BASIC

There is a limited amount of software for the Model 100. The computer is new, and it will take some time before lots of software will be available. Many programs for the Model 100 are already available in magazines like *PCM* and *Portable 100*. A typical issue includes five or six articles explaining how to use the computer for a particular use. The articles include listings of BASIC programs written specifically for the Model 100. To use these programs, you type them into the computer yourself.

The goal of this chapter is to tell you some of the things you will need to know to make use of programs printed in books and magazines. Since the Model 100 only has BASIC as a built-in language, we will talk only about BASIC. In the next chapter, we will tell you how to load programs into the computer from cassette tape and how to save them on cassette tape. After reading these two chapters, you should be able to use programs in books and magazines. You may find, as you work with your Model 100, that you want to learn to write some of your own programs. There are many good books that can help you learn BASIC programming. Let us suggest one that we have found to be a quick and easy way to get started with BASIC. *Instant BASIC* by Jerald Brown is published by dilithium Press and sells for $12.95. This is a very good tutorial on Microsoft BASIC and includes examples that are both useful and entertaining.

GETTING IN AND OUT OF BASIC

The first thing you need to do is turn the Model 100 on. This is done by sliding the on/off button to the on position. The on/off button is along the right side of the computer. As soon as the computer is turned on, the screen will display a menu of options from which you can choose.

Now you can select the menu option you want by moving the large cursor with the arrow keys. When the cursor is directly over the program you want to use, you press the ENTER key, and you are ready to go. To get into BASIC, move the cursor over the word BASIC and press ENTER. The screen will now say:

```
TRS-80 Model 100 Software
Corp.. 1983 Microsoft
2378 Bytes free
(This number of bytes free will vary according to the amount
of memory you have in your computer and the size and
number of files you have stored in memory.)
OK
```

Now you will type in a very short and simple program, run it, save it and exit from BASIC. The following steps need to be followed carefully:

1. Press the CAPS LOCK key so that it locks down. You can use either upper- and lowercase letters or all uppercase letters in Model 100 BASIC, but to keep things simple, we will use all capital letters. If you keep the CAPS LOCK key down, what you type on the screen will look like what we show you here.

2. Type: 10 PRINT "I AM THE MODEL 100 COMPUTER"

When you get to the end of the line, right after the quotation mark, press the ENTER key.

3. Type: 20 PRINT "WE CAN WORK GREAT TOGETHER"

Again, at the end of the line, press the ENTER key.

4. Now press the LABEL key, one of the small rectangular control keys just above the number keys. After you have pressed the LABEL key, you should see six words from left to right along the very bottom of the screen. Each of these words will have a number just below it. It should look like this:

```
File  Load  Save  Run  List          Menu

 1     2     3     4     5     6     7     8
```

This is the BASIC menu. It will only appear when you press the LABEL key while in BASIC.

We now have a short program that consists of two lines we can run. *Running* a program means the computer will follow the instructions given in each line of the program, beginning with the line with the lowest line number (10 in this program). Notice that the word *Run* is above the number 4. If you press the number 4 control key, the program in the computer's memory will be executed. Now press the number 4 control key, and you will see the following greeting appear on the screen:

```
I AM THE MODEL 100 COMPUTER
WE CAN WORK GREAT TOGETHER
```

This simple two-line program uses only one BASIC keyword: PRINT. PRINT tells the computer to display on the screen the material that follows PRINT. When the computer ran this program, it printed two lines of material on the display. Old material that was already on the screen was pushed up one line. The top line was actually pushed off the top of the screen.

Now let's save this program so that you can see how to come back to it after leaving BASIC. Look again at the BASIC menu with its numbers along the bottom of the screen. If you can't see this list, just press the LABEL key again, and the

list will reappear. Now you can see that the word *Save* is just above the number 3 on the menu list. If you press the number 3 function key, the program will be saved. By save, we mean the program will be stored in the memory of the computer. Let's try it. Press the number 3 function key and you will see:

```
Save "
```

The computer is asking you to give the program a name so that it can be added to the main menu. We will call this short program GREET. All you have to do now is type the word GREET and press ENTER. After pressing ENTER, you should see the OK appear again. The OK tells you the computer has finished executing the instruction you gave it and is ready for further instructions.

Now let's get out of BASIC and return to the main menu. You will notice that the word *Menu* is just above the number 8. Press function key number 8, and the computer will return to the main menu. Now that you have done this, you can see that one more item has been added to the main menu. The new item is GREET.BA. Notice that you only typed GREET, but the name of the program is now GREET.BA. The computer automatically adds the .BA to any BASIC program. BA stands for BASIC and lets you know which programs are BASIC programs and which are something else. Some of the items listed in the menu are programs permanently stored in the Read Only Memory of the computer (for example, BASIC, TELCOM), some are programs you have written (for example, GREET.BA), and some may be data for other programs (for example, a report you prepared in the word processor, or a telephone and address list). The report you wrote and collections of data like names and addresses are *files*. On the main menu, a variety of files are listed, and some may be BASIC programs.

Now that our little program is saved and added to the main menu, you can go back into BASIC and run it very easily. You do this simply by placing the large cursor over GREET.BA and pressing ENTER. When you do this, the computer not

only takes you to BASIC, it runs the GREET program for you. If you want to know how to get back to the main menu program again, just press the LABEL key, and you will see the BASIC menu at the bottom of the screen. This menu tells you that function key number 8 will return you to the main menu. Press function key 8, and you are back to the main menu.

Now let's review what you have done. You started at the main menu when you turned the computer on. Then you went to BASIC from the menu and wrote a simple two-line program. You then saw the program run. Next you saved the program under the name GREET. When you returned to the main program, you saw the new program listed as GREET.BA. By selecting this program from the main menu, you saw the program run again. You then returned to the main menu, and that's where you are now. If you do not have a program listed on your main menu called GREET.BA, you may want to go back and try the sequence again.

GIVING THE COMPUTER BASIC INSTRUCTIONS

There are two types of instructions you can give the computer: *statements* and *commands*. A command is an instruction the computer can act on immediately. RUN is a good example of a command. It's a one-word command that tells the computer to run or execute whatever program is in its memory. LIST is another important command used in BASIC. It tells the computer to print each of the lines in the program on the display. If you are in BASIC, and the screen is blank, you can type LIST, and if there is a BASIC program in memory, it will be placed on the screen so you can see it. The point is that a command usually tells the computer to do one specific thing. The computer does that one thing, then stops and waits to be told what to do next.

A statement, on the other hand, is part of a BASIC program.

It is one of a set of instructions the computer carries out in one sequence when told to do so.

Some words in BASIC can be used as either commands or instructions. Perhaps the best way to illustrate the real difference between commands and instructions is to look back at the program we saved and called GREET. In this program the word PRINT is used to tell the computer to print or write something on the screen. PRINT is one of the BASIC instructions that can be used both as a command and as a statement. First let's try it as a command. From the main menu, select BASIC and press ENTER. When you see the OK on the screen type PRINT "HI THERE". Now press ENTER, and you will see the words HI THERE appear on the screen. You gave the computer a command. The command was to print the words HI THERE on the screen. The computer did that and now is saying, in effect, "OK, I am ready for further instructions." Now look at the program GREET. It has two program lines, line 10 and line 20. Line 10 simply tells the computer to print I AM THE MODEL 100 COMPUTER. Line 20 tells the computer to print WE CAN WORK GREAT TOGETHER. In this case, however, PRINT is used as a statement. The computer did nothing when you typed in line 10 and line 20. Only when you told it to run the program did it follow the instructions in line 10 and line 20. If there had been more lines, it would have proceeded to those lines. When a BASIC keyword like PRINT is typed in a line which is preceded by a line number, it acts as a statement; when it is typed in a line which does not begin with a line number, it acts as a command.

The programs you type in from magazines or books will consist of numbered lines of statements which must be typed exactly as they appear or the program will not run properly. To use all those programs, you will have to use certain commands on your own in order to get the program typed in, saved, and run. In other words, you don't need to know what all the statements in a BASIC program mean, to be able to use it, but you do need to know some BASIC commands in order to make use of any program.

On page 100 of the instruction manual that comes with the

Model 100, the twenty commands in Model 100 BASIC are listed. We will cover the commands essential to BASIC programs. As you become more familiar with the Model 100, you may want to use some of the others. The commands you will need most are:

RUN—This tells the computer to follow the instructions in a program, beginning with the instructions in the line with the lowest line number.

CLS—This command tells the computer to clear the screen. You need this because the screen will often be cluttered up with so many words that it is hard to make any sense of things. By simply typing CLS and pressing ENTER, everything is cleared, and you have a nice clean blank screen. This command does not erase anything from memory. Whatever program you have in BASIC at the time will still be there. CLS only clears the screen.

ENTER—Some people don't think of this as a command, but it works like one. When you press the ENTER key, you are telling the computer you are finished with the line of material you have typed in. The computer will not work with that line until you tell it you have finished, by pressing the ENTER key.

LIST—This command lists whatever program is in BASIC at the time. If, for example, you have used CLS to clear the screen, and you now want to see the program again, you type in LIST, and the program will be listed on the screen. There are several variations of LIST.

LIST

Displays the entire program on the screen. If your program is longer than eight screen lines, some of it will scroll off the top of the screen as the last lines are displayed.

LIST ##

Lists the line with the number after LIST. LIST 20 will cause line 20, and only line 20, to be displayed on the screen.

LIST ##–##

Lists the program, beginning with the line with the first

number and ending with the line with the second number. LIST 40–200 tells the computer to list all the program lines from 40 to 200.

LIST ##–

If you type LIST 45– the computer will list all the program lines from 45 to the end of the program.

LIST –##

If you type LIST –45 the computer will list all the program lines from the beginning of the program to line 45.

KILL—This mean-sounding command means just what it says—wipe out or erase a program. KILL has to be followed by the name of a program. If you want to KILL a file, you have to give the message exactly like this: KILL "NAME". To illustrate this, let's use KILL to erase the GREET program. If you are not already in BASIC, go to BASIC and make sure you have the OK prompt and the blinking cursor waiting for you. Now type KILL "GREET.BA". Now press ENTER, and the computer will give you the OK sign again. Now return to the main menu by pressing the number 8 function key, and you will see that GREET.BA no longer appears on the menu.

MENU—We have already used this command several times. It tells the computer to return to the main menu.

NEW—This command erases a program from BASIC's memory only. It frees up BASIC so that you can type in a new program. It does not erase the program from the main menu or from the computer's main memory. To see how it works, try this: Starting from the main menu, select any BASIC program that appears on the main menu. If your computer is brand new, and there are no BASIC programs on the main menu, you might go back and type in and save GREET again. When you have selected a BASIC program from the main menu, you can list the program to make sure it is in BASIC. Now type the command NEW. The program has now disappeared. If you try to list it again, you will see that it is not there. Now return to the main menu, and you will see that your BASIC program is still on the menu and is still in the computer's memory.

?—The question mark is a shorthand version of the PRINT command. This handy command makes it easy to use the com-

puter as a calculator. If you want to know what 944 plus 437 is, for example, you could go to BASIC and type ? 994 + 437, press ENTER, and presto, you have the answer: 1381. What you told the computer to do is print the answer to 944 plus 437, and it did.

SAVE—We have already used this command. It tells the computer to save a program in the computer's main memory and include it on the main menu. After you type in a program that you want to keep, you will want to make sure you save it. Note that the keyword SAVE is used differently in other BASIC'S. Most computers use SAVE to tell the computer to save a program or data on a cassette.

The Model 100 makes several of the commands easy to use by putting them in a menu format. Remember that by pressing the LABEL key, you get a menu of Run, Save, List, and Menu at the bottom of the screen. Now instead of typing LIST, you can just press function key number 5, and the computer will list the program for you. These commands work either way: you can type the command in, or you can use the function keys.

There are two other commands on the BASIC menu. They are *Load* and *File*. Load lets you get a program stored on cassette tape into the computer. We will tell you more about *Load* in the next chapter. *File* is a command that lets you see what files are presently stored in the main memory of the computer without having to leave BASIC and return to the main menu. When you use the *Menu* command, you return to the main menu and then to get back to BASIC, you have to select BASIC and press ENTER. With *File* you are shown the list of files while still in BASIC, and then you can continue with what you are doing. The *File* command can only be used by pressing the number 1 function key. It cannot be typed in as can other commands.

PROGRAM LINES

All BASIC programs have program lines, and each line is labeled with a line number. These line numbers have to be whole numbers. You cannot label a line 2.5 or .6, for example. The program called GREET had two program lines labeled 10 and 20. The reason you need program line numbers is so both you and the computer can keep track of where you are in the program. One of the very important BASIC instructions, is the GOTO instruction. GOTO tells the computer to stop executing lines in numerical order and jump to another location in the program. Line numbers are what makes this instruction work. If the computer is at line number 200 in a program, and it needs to go to another place in the program, let's say line 350, the program can tell the computer to do this by saying GOTO 350. It is customary to number program lines in units of ten for example, 10,20,30,40, and so on. The reason for this is to provide room to insert new lines as you edit, enhance, and correct the program. For example if you wanted to add a new line between lines 30 and 40 you could call it 35. More lines (31, 32, 33, 34, and so on) can be added between 30 and 40 if necessary.

As you type programs into the computer, be sure to keep close track of the line numbers. You should not try to change the line numbers since the program executes lines numerically. If you name a line 45 when it should be 145, the program won't work because it will try to execute the instructions in that line too early.

SYNTAX

Syntax is a fancy word that means *the proper arrangement of words and punctuation marks in a sentence*. You may re-

member something about syntax from your English classes. The period has to go in the correct place; you should only use a semicolon in certain situations, and the subject always comes before the verb. Syntax is very important in computer programs. Each language has its own set of rules for the proper arrangement of words and symbols. The problem is that computers are not nearly as friendly as your English teacher. Your English teacher may have been a stickler, but the computer is worse. If the syntax is not *exactly* right, the computer can't stop and figure out what you really meant. It just stops and refuses to go on until you fix the error.

When you type in a program, you will need to be very careful to make sure that you type each line just as it appears in the listing. If you were an experienced programmer, you might change the syntax of a program line as you type it in, because you want the program to work slightly differently or more efficiently. You may know there are really several ways to tell the computer to do something and decide that you like your way better than the programmer's way. If you are not an experienced programmer, changing the syntax can create all sorts of problems you didn't even consider. Changing one thing in a program line may prevent the whole program from working. Let's look at one example:

```
10 PRINT "X"
20 PRINT X
```

Here you see two program lines numbered 10 and 20. These program lines look the same except for one thing, the quotation marks. If this were a letter to a friend, he or she could understand your letter even if you didn't use quotation marks precisely as they expected. In BASIC, however, the quotation marks make a world of difference. Line 10 above tells the computer to place the letter X on the computer screen. Line 20 tells the computer to place whatever value might be assigned to the letter X on the screen. Somewhere else in the program, the computer may have been told that X should be assigned the value 9. This being the case, when the computer gets to

line 20 it will print a 9 on the screen. So you can see that syntax is very important if you want a program to do what it is intended to do.

OPERATING FROM THREE MODES

It seems that in our new age of advanced technology everything has to have more than one *mode*. And so it is with BASIC in the Model 100. There are three modes: The *Command Mode*, the *Execute Mode* and the *Edit Mode*.

Command Mode

You are in the command mode whenever you see the OK and the blinking arrow just below it on the screen. This means "OK, I am sitting here waiting for you to command me to do something." When you are in the command mode, you can give the computer any of the commands we explained above or any of the additional commands shown on page 100 of the instruction manual. You can also begin typing in a program. The computer knows when you are typing in a program rather than just giving it a command because you use line numbers. When you type in a program, the computer doesn't do anything with the program until you tell it to. You tell it to do something with the program with either RUN or LIST.

Execute Mode

The execute mode simply means the computer is taking action on an instruction or set of instructions. You go into the execute mode whenever you press the ENTER key. If you give the computer a command like LIST, it does nothing except print the letters LIST on the screen until you press the ENTER key. When you press the ENTER key, you go automatically

into the execute mode, and the computer carries out your command by listing the program. When you have a program typed in and are ready to run it, you give the command RUN, then press ENTER, and the computer goes into the execute mode, runs the entire program, and returns to the command mode, ready to receive another command.

Edit Mode

We have emphasized several times the importance of typing in a program *precisely*, whether you are writing a program yourself or typing one from a magazine. This is all well and good except for the fact that most of us tend to make errors when we are typing. The edit mode allows you to correct your errors in three ways.

• Back up and retype before pressing ENTER. You can correct any error in a program line or in a command before you press the ENTER key by simply backing the cursor up with the left arrow key and then retyping the line from the point of your correction. Let's try it. Get into BASIC and type: 10 PRINT "THIS IT A TEST". Now before you press ENTER, you can see you have IT where you really mean IS. You can press the left arrow key, and the cursor will start moving backwards along the program line, erasing letters as it goes. When you are to the left of the T in the word IT, stop and then retype the line so that it says 10 PRINT "THIS IS A TEST". It is important to note that this can only be done before you press ENTER. Once you have pressed ENTER, you cannot back the cursor up and retype.

• Retype the entire line with the same line number. Sometimes you may not discover that you have made a typing error until you have already pressed ENTER. The second way to edit a program line is to simply retype the entire program line using the same line number. Now you will have two lines with the same line number. This is no problem. The computer replaces the old line with the new one. If you tell the computer

to RUN or LIST the program, the new line will be used. For example, if you type 10 PRINT "THIS IT A TEST" and press ENTER, before you discover your error, you can retype the whole line like this 10 PRINT "THIS IS A TEST". The new line 10 replaces the old line 10.

• Type EDIT and use the Text editor. The EDIT command puts you in the text editor mode, and you can make changes in the program line just as you would in a line of text if you were doing word processing on the Model 100. You can edit the entire program just by typing EDIT. When you do this, the screen is filled with program lines, and you can move the cursor around until you are over the place where you want to make a correction. You may want to go back and look at Chapter Two for a detailed description of how to use the editor, but we will also remind you here. To delete the character the cursor is over, hold down the SHIFT key and press the DEL BKSP key. To delete the character just to the left of the cursor, just press the DEL BKSP key. To insert one or more characters, just position the cursor over the place where you want to insert and type in whatever you want to insert. To replace a character, you have to delete the old character first and then insert the new character.

If you don't want to edit the entire program, you can tell the computer to let you edit one line or several lines. To edit just one line, type EDIT and then a line number, for example EDIT 30. To edit a series of lines, type EDIT and then the starting line of the series and then the ending line of the series, for example, EDIT 20–50.

When you have finished editing, you must escape from the text editing mode by pressing the number 8 function key. One note of caution: if you are using the text editor to edit a BASIC program, all of the program lines must be made up of legitimate BASIC statements. If you end up with characters that do not belong in a BASIC statement, the computer gets very unfriendly when you try to escape for the text editor. The computer gives you the message *File is illformed*. You cannot escape from the text editor until you edit out any unwanted

characters. You can press the reset button or even turn off the computer. As soon as you turn the computer back on, you will find yourself right back in the text editing mode. No amount of button pushing or pounding will let you escape. So, when you get the *File is illformed* message, just relax and delete anything that doesn't belong; then you can get back to BASIC. Because of this problem, if you are unfamiliar with both BASIC and the Model 100 computer, we suggest that you not use the text editor in the early stages of using the computer.

CHAPTER SEVEN

Using BASIC Programs

In Chapter Five, we told you about computer programs and the languages that can be used to build them. In Chapter Six, we told you some of the basic things you need to know to make use of the built-in programming capability of the Model 100 computer. In this chapter, we will show you a program and demonstrate how to type it in and get it running. Then we will tell you how to save a program on cassette tape and load it back into the computer. Finally, we will show you a longer program you may want to keep for your own use. This last program will tax your skills and prepare you to make use of Model 100 programs you may find printed in books and magazines.

TYPING IN AND RUNNING A PROGRAM

Program 1: *Times*

```
10 REM TIMES TABLE DRILL
20 PRINT "WHICH TIMES TABLE DO YOU WANT"
30 INPUT T
40 LET M = 1
50 PRINT M; "X"; T;" = ?"
60 INPUT A
70 IF A=M*T THEN GOTO 90
```

```
80 PRINT "NO"; M; "X"; T; " = "; M*T
90 LET M = M + 1
100 IF M = 13 THEN GOTO 20
110 GOTO 50
120 END
```

Program 1 is a times table drill. You can tell the computer which table you want to be drilled on (for example, the fives, nines, and so on), and the program will run you through that table. When you type in a correct answer, you get the next problem. If you get the wrong answer, the computer tells you the right answer and then gives you the next problem.

Let's type this program in and get it running. When you are in BASIC, be sure no other program is in the memory set aside for BASIC. To do this, type the command NEW and press ENTER. You might also want to start with a clean screen. You can clear everything from the screen by giving the command CLS. Now you should be ready to begin typing in the *Times* program. As you begin, keep two things in mind. First, be very careful to type each line just as it appears here, otherwise the program will not work. Second, look back at each line before you press ENTER. The easiest way to edit short program lines is to back the cursor up and retype the line from where you made an error. You can't do this after you press the ENTER key.

When you have typed the entire program, look at it line-by-line and make sure each line is exactly as it appears on the printed page. If you see any differences, you will need to edit that line, either by completely retyping the line or by using the text edit mode. One of the problems you will experience with the Model 100 is that you can see only a few lines of the program on the screen at one time. The way you get around this problem is to use the PAUSE/BREAK key. This is the control key just left of the PRINT key. The word BREAK is just above the key and the word PAUSE is just below the key. This key has two functions: it can either cause the computer to pause, or stop temporarily, during the execution of a program, or it can cause the program to break, or stop perma-

nently. By pushing the PAUSE/BREAK key by itself during execution you get a pause; all action stops. By pushing it again, the action starts again, and the program continues executing. By holding down the shift key and pushing the PAUSE/BREAK key, you get a break in the program. All action stops, and you have to give either the RUN or the LIST command to start it again. To view an entire program, you have to give the LIST command and then press the PAUSE/BREAK key each time a new set of program lines appears on the screen. Then you press the PAUSE/BREAK key again and the listing will continue. Keep in mind that the LIST command has several different versions. You can use a version that puts only a few lines on the screen.

Now for the exciting part: running the program. When you feel all of the program lines are typed correctly, press the number 4 function key, and the program should run. If the program runs, you will see WHICH TIMES TABLE DO YOU WANT appear on the screen. Just below this question, you will see a question mark followed by the cursor. The computer is waiting for you to respond to the question. Try answering the question with 2. Now press ENTER and you should see 1 × 2 = ? Again, the computer is waiting for your answer. If you type in 2, you should next see 2 × 2 = ? Just to test one more thing, try giving the wrong answer. Now you should see NO 2 × 2 = 4. If the computer has performed as described here, you know you typed the program correctly. If the program will not run, or if it gives you responses other than the ones we have shown here, there is an error in the program. You may, in fact, get an *error message* that tells you the computer has a problem understanding what you want it to do.

On page 217 of the instruction manual for the Model 100, there is a list of 33 error messages the computer may display if it finds errors in a program. Nearly all of these errors will have little meaning to you if you do not know the BASIC programming language. The most common error message you will see is SN, which stands for syntax error and simply means that something has been typed incorrectly, and the computer

doesn't know what the instruction means. If you are learning BASIC and writing your own program, you can consult the table of BASIC error codes in the instruction manual. If you are simply trying to type in and use a program from a book or magazine, you should first assume that if an error message appears, you have made a typing error. Double check each program line against the printed version of the program and try to spot your error. Unfortunately, you will not always be at fault. Programs printed in magazines and books frequently have errors in them because of a misprint, or even a logic error on the part of the programmer. Some people make it a point to avoid trying to use a program for a month after it has been published. When the next issue of the magazine comes out, they check for erratum notices for the program they want to use. Then they incorporate the corrections into the program.

In spite of the frequency of errors in published programs, you should probably still assume that you have made a typing error when an error message appears. If you thoroughly check the program and find no error, then consider the possibility of an error in the printed copy of the program. If you cannot find the error, and you feel sure you have the program typed just as it appears in the printed version, you may want to get a friend who knows BASIC well to check the program for logical errors.

SAVING A PROGRAM ON CASSETTE TAPE

In Chapter Six we told you how to save a program in the main memory of the computer so it would be available when you wanted to use it again. Now we will tell you how to save a program on a cassette tape for permanent storage. Your computer has only a limited amount of internal storage capacity—a very limited amount if you have only 8K or 16K of RAM. The number of programs and data files you can store in the main memory of the computer is limited. You will soon

run out of storage space if you try to store every program you want to keep in memory. This problem can be solved by storing some programs on cassette tape.

Connecting the Recorder and the Computer

First, you will need the proper equipment. In addition to the Model 100 computer, you will need a cassette tape recorder, a cassette tape and a *recorder-to-computer connection cable.* For best results, we recommend that you use the Radio Shack CCR-81 Computer Recorder. This recorder sells at Radio Shack for $59.95, including the connection cable. Most standard cassette tape recorders will also work with the Model 100, but sometimes getting the volume and tone controls set just right is tricky. If you use another tape recorder, the connection cable can be bought for $9.95 at Radio Shack.

Connecting the recorder to the computer is very easy. The

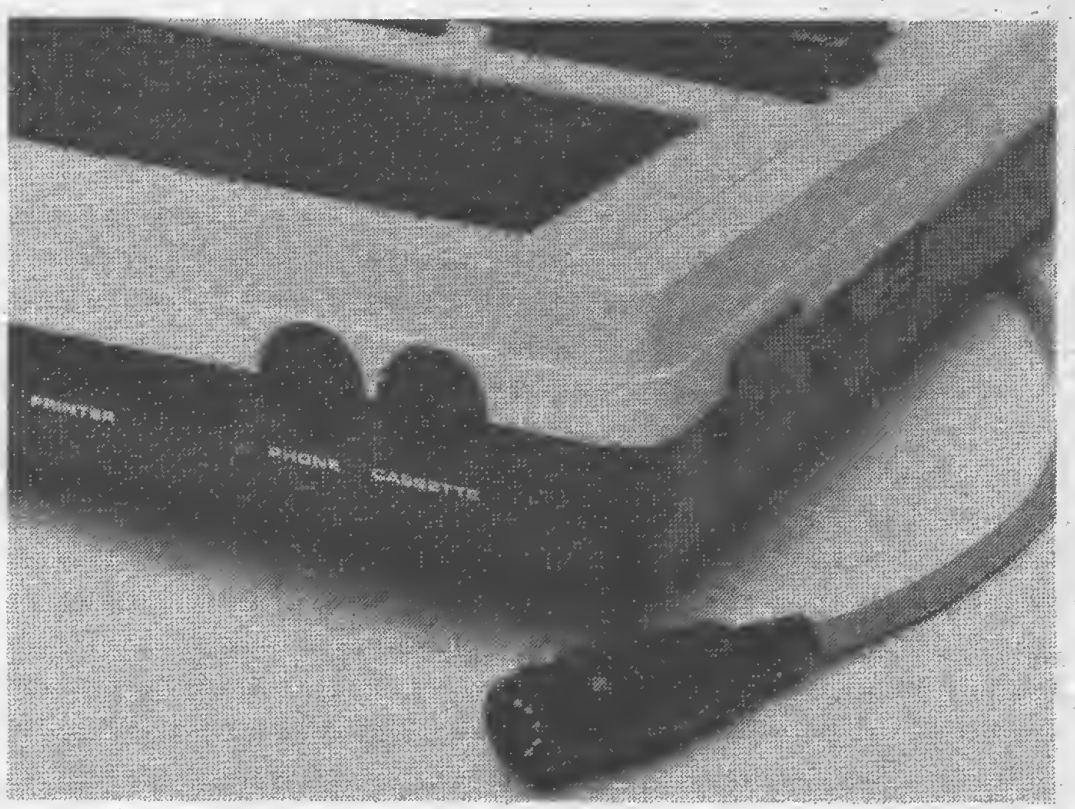


Figure 7.1 Cassette port and round plug on the connection cable

end of the connection cable that has one round plug fits into the back of the computer where it says CASSETTE. The other end of the cable has three plugs that will usually fit into the side of the tape recorder. The Radio Shack recorder has the holes marked where the three plugs go. If you are using another brand of recorder, you may have to get the plugs in the right holes by trial and error. There are three plugs at the recorder end of the connecting cable, one black and two gray. The black plug goes into the EAR connector of the recorder. One of the gray plugs has a bigger tip than the other. The big tip goes into the AUX connector, and the small tip goes into the REM connector. Getting the small tipped plug into the right place is easy, because it will only fit in one connector.

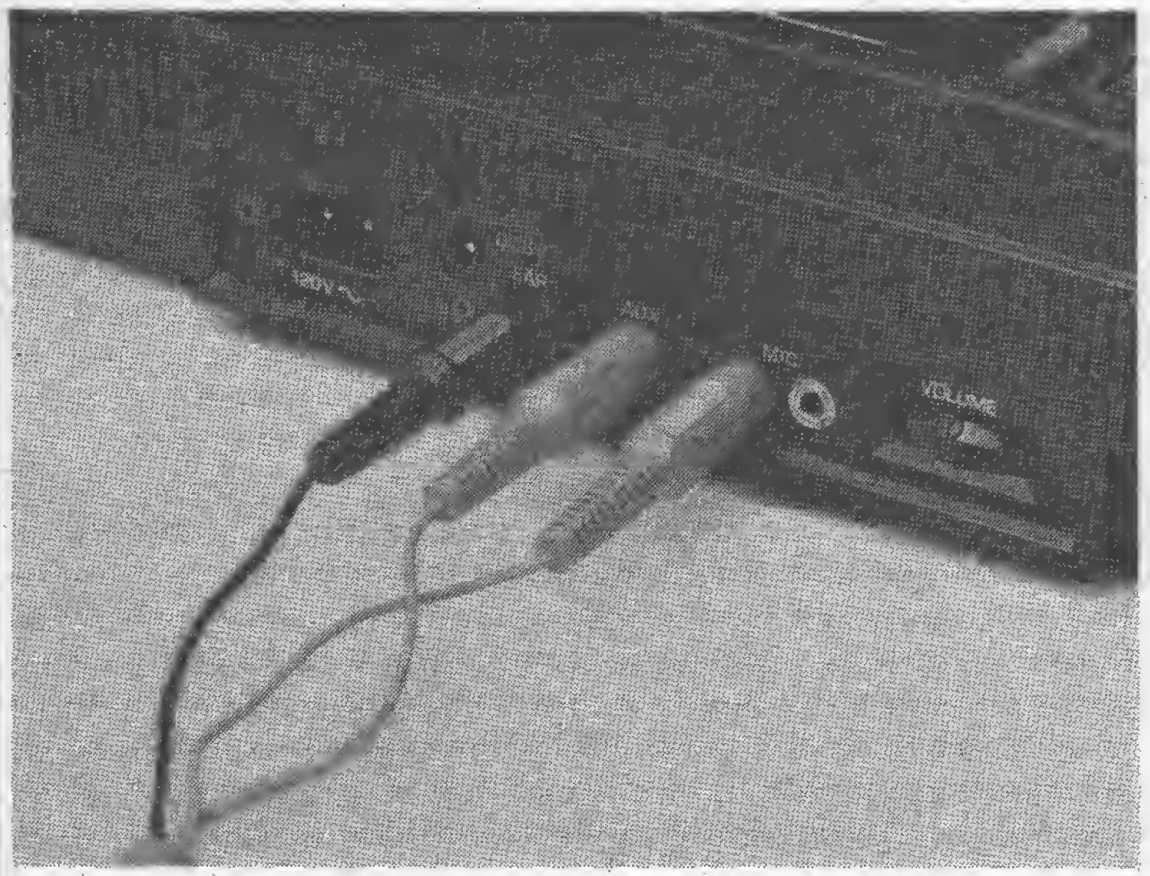


Figure 7.2 Recorder end of the connection cable

Getting the Recorder Ready to Receive the Program

You will need a cassette tape in the recorder. If you have nothing else on the tape, rewind it to the beginning. If you have other information on the tape, find a place where nothing else is recorded. (Better yet, get another cassette and put only one program or data file on each side of a cassette.) It is a good idea, if you have a counter on the recorder, to set the counter to 000 and to start at the beginning of the tape. Now press both the RECORD and PLAY keys until they lock down. Your recorder is now ready to record, but you will notice that nothing is happening. This is because the recorder needs a signal from the computer to begin.

Sending the Program to the Recorder

There are two ways to give the computer the command to save a program on tape. The first way is to press the number 3 function key. When you press the F3 key you will see SAVE". You now type CAS which stands for cassette and then the name of the program. The second way, which seems simpler, is to just type the command CSAVE"NAME". We will try saving the *Times* program so you can see how it all works. Get the recorder all set up and ready to record. Now make sure you are in BASIC and have *Times* in BASIC memory. Type CSAVE"TIMES" and press ENTER. The recorder should start turning, and when the program has been saved, the computer will tell you by displaying the OK sign. You should now release the RECORD and PLAY keys.

NOTE: A common problem when using a cassette tape to store computer programs is the leader at the beginning of a tape. On some brands these leaders are very long. The computer turns on the tape recorder and lets a short length of tape run

through before beginning to record the program. Usually that is enough to get past the leader. If the cassette you are using has a long leader, however, the beginning of the program may be missed because the leader of the tape was still running through the recorder. We make it standard practice to record a program twice, one right after the other, to give us two chances of getting a *good save*. We suggest you buy short tapes (for example, C-30) with very short or no leaders from companies recognized for quality. If you buy cheap four-for-a-dollar tapes, you are asking for trouble.

LOADING A PROGRAM FROM A CASSETTE TAPE

There are two situations when you will want to load a program into the computer from a cassette tape. One is when you have saved a program on tape yourself for safekeeping and want to use it again. The other is when you buy a piece of software that consists of a program stored on cassette tape. Now let's see exactly how to load a program.

Getting the Recorder Ready For Loading

The hardest part of the loading process is getting the cassette tape rewound to the right place. Before you can load a program the cassette must be rewound to a point that is in front of the place where the program is recorded. If you started with a new tape, you can just rewind the tape to the very beginning. If not, you will have to make sure you are starting somewhere before the start of the program. This is where a counter comes in handy. On most tape recorders, you cannot rewind the recorder with all of the connectors plugged in. You have to remove the gray plug with the small tip, if your recorder will not rewind with the plugs in. When the cassette is rewound to the right place, press the PLAY key so it locks down. Now

the recorder is ready to send the program and just needs a signal from the computer.

Telling the Computer to Load the Program

The BASIC command for loading a program from cassette tape is CLOAD. There are three options for this command:

• CLOAD The command by itself tells the computer to load the first BASIC program it finds. If you only have one program on your tape, or if you know exactly where your program is on the tape, this is the easiest way to get the program into the computer.

• CLOAD"NAME" When the program name is added, the computer searches for the right program as it goes. It lists each program name on the screen as it finds it. When it finds the program you have specified, it loads it into the computer.

• CLOAD"NAME",R The R stands for Run. When the R is added, the computer finds the program, loads it in and runs it.

The CLOAD command can also be given by first pressing the number 2 function key, then specifying that you want to load from cassette with the CAS in front of the program name.

Let's try loading *Times* back into the computer, now that it is saved on cassette tape. Go to BASIC and clear both the BASIC memory and the screen with NEW and CLS. Now get the recorder ready and type CLOAD"TIMES". When the program is found, the computer will make a buzzing noise. This noise will stop as soon as the program is loaded.

ANOTHER PROGRAM

Now that you know the basics and have had some practice, let's try it for real. Program 2 is from a book called *32 BASIC Programs for TRS-80 (Level II) Computer* by Tom Rugg and

Phil Feldman and published by dilithium Press. This program was modified by Brian Carman for the Model 100. It will help you analyze loan options and payment variables.

Program 2: *Loan*

```
100 REM: LOAN CALCULATOR
110 REM: COPYRIGHT 1979 BY TOM RUGG AND PHIL
FELDMAN
120 CLEAR 50: CLS: DEFINT J,L,N:DEFDBL A-F,M,P-
Z
130 PRINT TAB(8);"LOAN CALCULATOR"
140 PRINT
150 INPUT "LOAN AMOUNT"; A
155 GOSUB 1000: IF A = 0 THEN 150
160 INPUT "INTEREST RATE"; R
170 INPUT "LENGTH OF LOAN (MONTHS)"; N
180 R = ABS(R):M = R/1200
190 GOSUB 800
200 W = (1 + M)N
210 P = (A*M*W)/(W-1)
220 P = INT(P*100 + .99):P = P/100
230 PRINT "MONTHLY PAYMENT IS"; P
240 FP = P:PRINT
250 PRINT "NEXT ACTION:"
270 PRINT " 1-SHOW MONTHLY ANALYSIS"
280 PRINT " 2-OVERRIDE MONTHLY PAYMENT"
290 PRINT " 3-START OVER"
300 PRINT " 4-END"
310 INPUT "CHOICE"; C
320 ON C GOTO 440, 400, 120, 370
325 CLS
330 PRINT "CHOICES ARE 1, 2, 3, AND 4"
340 GOTO 250
370 END
400 PRINT : INPUT "MONTHLY PAYMENT"; P
410 GOTO 240
```

```
440 GOSUB 450 :GOTO 510
450 GOSUB 800
460 PRINT TAB(7); "REMAINING"; TAB(21);
470 PRINT "-----INTEREST-----"
480 PRINT "MONTH BALANCE"; TAB(22);
490 PRINT "MONTH TO-DATE"
500 RETURN
510 B = A*100:TP = 0:L = 0:P = P*100:R$ = ""
520 FOR J = 1 TO N
530 T = M*B
540 T = INT(T + .5)
560 TP = TP + P: B = B - P + T: TT = TT + T
565 IF B < 0 THEN GOSUB 2000
570 IF R$ = "T" THEN 660
580 PB = B/100
590 PT = T/100
600 T2 = TT/100
610 PRINT J; TAB(5);
615 PRINT USING "########.##-"; PB; PT; T2
617 IF B = 0 THEN J = N:GOTO 630
620 L = L + 1: IF L < 1 THEN 660
630 PRINT "PRESS 'T' FOR GRAND TOTALS"
635 PRINT "ANY OTHER KEY WILL CONTINUE";
640 R$ = INKEY$ = "" THEN 640
650 L = 0: GOSUB 450: IF R$ = "T" THEN PRINT
"CALCULATING TOTALS . . ."
660 NEXT
665 PRINT
670 PRINT:PRINT "LAST PAYMENT =" ; P/100
680 PRINT "TOTAL PAYMENTS ="; TP/100
690 PRINT "MONTHLY PAYMENT WAS"; FP
710 PRINT:PRINT "PRESS ANY KEY TO CONTINUE"
720 R$ = INKEY$: IF R$ ="" THEN 720
725 CLS
730 P = FP:GOTO 240
800 CLS
810 PRINT A;"FOR"; N; "MONTHS AT"; R; "PER CENT"
820 PRINT
```

```
830 RETURN
1000 A = ABS(A):A = INT(A)
1010 IF A < 10000000 THEN RETURN
1020 PRINT "THAT NUMBER IS TOO LARGE"
1030 A = 0:RETURN
2000 P = P + B:(TP = TP + B):B = 0
2010 RETURN
```

Loan is a longer program than you have worked with so far and will give you some good practice in getting programs in and out of the computer and stored on tape so you can use them. Loan is also a very useful program and one that is well suited for the Model 100. When you run *loan*, it will ask you three questions:

```
LOAN AMOUNT?
INTEREST RATE?
LENGTH OF LOAN (MONTHS)?
```

When you have given the computer amounts in these three categories, a menu provides you with several options for information the computer will generate. Included in the options are how much your payment would be each month for the duration of the loan and what the grand total of your payments would be.

With the information in Chapters Five, Six, and Seven, you should be able to use a variety of interesting and useful programs found in books and magazines, as well as commercial programs for the Model 100 on cassette tape.

CHAPTER EIGHT

Tapping into the World: Telecommunications

Of all the things you can do with your TRS-80 Model 100 computer, the things discussed in this chapter may be among the most exciting and interesting. In our book, *Computers for Everbody*, the chapter on telecommunications is called *The Outer Limits*, implying that using your computer for telecommunications opens up some way-out possibilities. As you read about what you can do with telecommunications, you may get the feeling that you really are getting into the space age. The Model 100 was designed with telecommunications in mind. It is in the forefront of computer technology in this area, since it has all of the necessary hardware and software built in.

WHAT IS TELECOMMUNICATIONS?

Telecommunications means simply computers talking to other computers. In some cases, small computers like your TRS-80 Model 100 will talk to other small computers. In other cases, small computers will talk to larger computers. Why do we want computers to talk to other computers? Because in this way they pass information back and forth, and the acquisition and use of information is a very important part of our world.

The timely acquisition of information has always been important. The original long-distance runners ran not for pleasure or competition or even for fame. They ran in order to speed up the flow of information from one place to another. Remember the heroic Pony Express riders? They cut the time it

took to get mail from the Eastern part of the United States to California by less than half. This was an important event in history simply because it meant people could send and receive information faster. Later, the telegraph, radios, televisions, telephones, transatlantic cables, and communications satellites became important, because they too made communicating faster and better. Now we are entering a new era in communications. We will use computers in homes, schools, and offices to send and receive vast amounts of information almost instantaneously.

The Model 100 computer is part of this new era in communications. The Model 100 is so completely portable that you can take it wherever you go. You can pack it in a briefcase or carry it under your arm when you are traveling. As soon as you get to your motel room, you can make contact with the office computer back home and send and receive information, or you can tap into the databanks of over 200 information services that keep up-to-date information on a variety of topics.

TYPES OF TELECOMMUNICATIONS SERVICES

Information Utilities

When you go to your kitchen sink to get a glass of water, you simply turn on the tap and out flows the water. A similar thing happens when you turn on the electric lights in your home or when you tune into your favorite cable television station. Water, electricity, and cable television services are called *utilities*. A utility service becomes available to you when you have the proper receiving equipment: the kitchen sink, the electric light, or the television set, and when the receiving equipment is properly connected. Telecommunications can be thought of as a family of information utilities. Lots of services are now offered and many more will become available in the near future.

In order to receive such a service, you will need the right equipment, you will need to make the appropriate connections, and in most cases, you will need to pay a utility fee.

Your TRS-80 Model 100 computer has all the equipment you will need to use a variety of information utilities. There are five types of service you can get by joining one or more of these information utilities.

Information Management

Your computer can get many types of information by linking up with larger computers where the information is sorted and stored. A doctor can check for information on a new disease, a professor can find foundations that give money for research in a particular area, and a consumer can locate a store that sells a particular item or brand. There are at least three advantages to using your computer to get this information: The computer can get the information very rapidly, the computer brings the information right into your home or office, and the computer does much of the sorting and searching—a time-consuming job when you do it yourself.

Electronic Mail

You can use your computer to send and receive messages. This service is called electronic mail. It lets you use your computer to send information to someone else without going through the U.S. Postal Service. In addition, there are numerous electronic bulletin boards and newsletters containing special types of information. You will be able to read notes and articles written about your computer. In some cases, you may want to use your computer like a telephone or two-way radio to chat back and forth with someone in a different part of the country. The advantage of using your computer instead of the telephone is that, with your computer, you type your part of the conversation, and the part of the conversation you receive is also typed. You can study and ponder each segment of the conversation and even print it out.

Consumer Service

Imagine touching a few keys on your TRS-80 model 100 computer and making all your travel arrangements yourself at any hour of the day or night. Your computer can help you find programs you want to use, locate reviews of products and software, and search for articles on consumer topics, such as microwave ovens, compact cars, or financial services.

Downloading Programs

Some services provide a list of computer programs available to users. If you want to buy one of the programs, the service will transmit, or download, the program to your computer and bill you for the cost of the program at the end of the month. In some cases, the programs are free. When you are connected to the right utility, you can download some programs to your TRS-80 Model 100 computer right now. The information utility called CompuServe, for example, has over thirty programs that can be downloaded and used on the Model 100.

Computing

It may seem obvious that a computer can be used for computing, but here we are talking about something a little different. One advantage of small computers is that they can be used by themselves, without connecting them to other larger computers. However, there may be times when you need to use the computing power of a gigantic two-million-dollar computer system. You probably can't afford to buy such a machine, but you can put your TRS-80 Model 100 computer in contact with it, and you can take advantage of its computing power for a small charge.

TELECOMMUNICATIONS WITH YOUR TRS-80 MODEL 100

You can join one of several different information utilities just by signing up and paying a fee. Then, as long as you pay your bills, you will be able to use their services. Some of the information utilities are for general use and provide a wide variety of different services. Others are more specialized. While the specialized information utilities do not offer as wide a variety of services, they go into much more depth on one particular subject. Some financial services, for example, won't have any information on the weekend football games, but they can provide detailed information on the performance of thousands of U.S. and foreign corporations. The disadvantage to some of these specialized services is that they are very expensive and difficult to use, although a few, like the Dow Jones News/Retrieval Service, are quite reasonable.

There are actually thousands of different types of information utilities. There is a utility for almost every walk of life. We will tell you about just a few of them and give you some detail on one service called The Source, one of the most popular and extensive telecommunications services.

First we will list some of the specialized services. Even though these services may be of interest to few TRS-80 Model 100 users, it is interesting to see the range of services you can get.

SPECIALIZED SERVICES

• *Business Computer Network.* The Business Computer Network offers a database of such items as news and stock and commodity prices. The Network also offers electronic mail, a

weekly on-line newsletter, and downloading of software. There are no sign-up fees for this service. Members pay only on-line service charges and a monthly utility fee.

• *Electronic Warehouse*. This is a special utility that allows you to shop for Model 100 software by using the Model 100 computer as a telecommunications device. You will be able to log onto this utility and review a catalog of software. When you see some software that you want, you can enter your credit card number and make a purchase. Once the host computer is satisfied you will pay, it will download the program and a brief version of the instruction manual. The next day, the same program on cassette tape and a full instruction manual will be shipped to you. This is an expedient way to shop for software for the Model 100 computer. It should be *on line* by the time you read this.

• *DIALOG Information Retrieval Service*. This service has a huge computer complex containing billions of references on every imaginable subject. Because of the high cost of this service, it is used primarily by professionals at libraries and universities. You would use it if you were trying to do in-depth research on a certain subject. Instead of going to the library and searching through references, books, and magazines, the computer does all the searching and gathers the information for you. DIALOG now has a special version of its service called *Knowledge Index*, for small computer users. It costs $35 to sign up; with this initial fee, you get two hours of search time. After that, it costs $24 an hour to use the system.

• *Money DOS*. This is a free bulletin board on financial investments. The person who gives the advice and runs the bulletin board is J. M. Keynes, a senior vice president of investments for a member firm of the New York Stock Exchange. With your Model 100 set up for telecommunications, you can receive Mr. Keynes' latest advice, and if you have a printer, you can have it printed out for later reference.

• *The Encyclopedia Britannica*. This gives you the full text of the *Britannica 3* encyclopedia and covers the ten-volume *Micropedia*, which contains important facts in capsule form. Other special editions such as *Book of the Year* are also in

cluded. You can tell the system to search for information on a particular topic, and it will electronically search the entire encyclopedia for information on that topic.

GENERAL SERVICES

There are two major general-purpose information utilities that are very popular. They are The Source and CompuServe. These two utilities are similar and offer a wide variety of services, but The Source is probably the most complete.

Some of the services you can get from The Source are:

- *UPI News Service*. This is the broadest category of service offered by The Source. Here you will find general, business, economic, weather, commodity, federal, and feature news reports. You can get the latest news before it is printed. News stories can be on your computer screen within minutes after they are released. By using a *keyword* search, you can even gather news stories on a specific topic.
- *Electronic Mail*. You can communicate with other subscribers across the country with your computer. You can transmit simple messages or lengthy reports quickly and economically. You can write notes, memos, letters, documents, and files at home or in your office and send them immediately. You can receive similar information from others and have your computer print it out or file it electronically, so you can read it later. With electronic mail, you can send a printed message with the speed of a phone call.
- *Electronic Travel Service*. In addition to being able to make your own airline and hotel reservations, you can get restaurant rating guides and use international airline schedules. You have access to worldwide airline flight information, which is updated every two weeks. If you were going to visit either New York or Washington, D.C., you could get listings of services ranging all the way from fur rental to babysitting before you left home. One service called the Travel Club can be used

just like a travel agency. You can wrap up all of your travel plans by asking the Travel Club to order tickets and make reservations.

• *Educational Programs*. You can call on a variety of educational programs to help your children learn the alphabet, the decimal system and much more. You can get programs to teach spelling, math, foreign languages, and science.

• *Consumer Aids*. You can get articles on how to reduce energy costs and save gasoline and assistance in choosing the right wines or the right vitamins. A service called Comp-U-Store amounts to an electronic super market. You can review items and prices on the computer screen and place your order from the computer keyboard. Then there is TradeNet, a barter service. With it, you can barter trips, professional advice on a range of subjects, and items of almost any description.

• *Sports News*. You can get up-to-the-minute news on sports, team standings, sports trivia, and sports records, as well as round-ups of scores on a national, international, and statewide level.

• *Financial Service*. Business and financial forecasts from professional economists and security analysts are up-dated weekly.

• *Portfolio Management*. You will have access to a system that will help you create and maintain your personal investment portfolio. By simply entering the name of a file containing your stocks, you can get an up-to-date report on each stock on your computer screen.

• *Legi-Slate*. With this service, you can track bills referred out of Congressional committees and list members of Congress by state, party, committee, and subcommittee. This service is up-dated weekly.

• *Commodity News Service, Inc*. This service allows you to track price movements in commodities futures markets and provides you with market commentary and commodity news.

HOW TO USE THE MODEL 100 FOR TELECOMMUNICATIONS

Chapter 11 of the Model 100 instruction manual gives you twenty-six pages of clear and complete instructions on how to use the built-in telecommunications capability of this computer. This section of the manual is probably the easiest to read and follow. We will not duplicate these instructions for you here, but rather give you an overall view of what the Model 100 can do and how it does it.

The Model 100 Telecommunications Equipment

The Model 100 comes equipped with three things that are optional on most other computers:

• *Modem*. The Model 100 has a built-in direct-connect modem. You can connect the computer directly into a telephone line. In order to use the direct-connect modem, you must have a Model 100 Modem Cable, which can be bought at your local Radio Shack store for $19.95. You must also have access to a *modular* telephone system—the type in which you can unplug your telephone from a wall socket and plug it back in, just as you plug your toaster in and out of an electrical wall socket. In cases where you do not have access to a modular telephone system, you can use an acoustic coupler. This is a small device that holds the handset of your telephone and converts sound into electronic signals. Good illustrated instructions on how to make both types of connections are provided on pages 76 through 79 of the instruction manual. The direct-connect system is much more reliable and easier to use than the acoustic coupler system.

• *Automatic Dialing*. This feature costs a considerable amount of money if you have to buy it as a separate piece of equipment for a computer. With this built-in feature, you can preprogram the Model 100 to automatically dial and log you into a variety of information utilities.

• *Smart Terminal Software*. With most computers, you need a special software package to give the computer the necessary instructions on how to communicate with other computers. These software packages are usually called smart terminal software packages. In the Model 100 this software is built in as part of TELCOM.

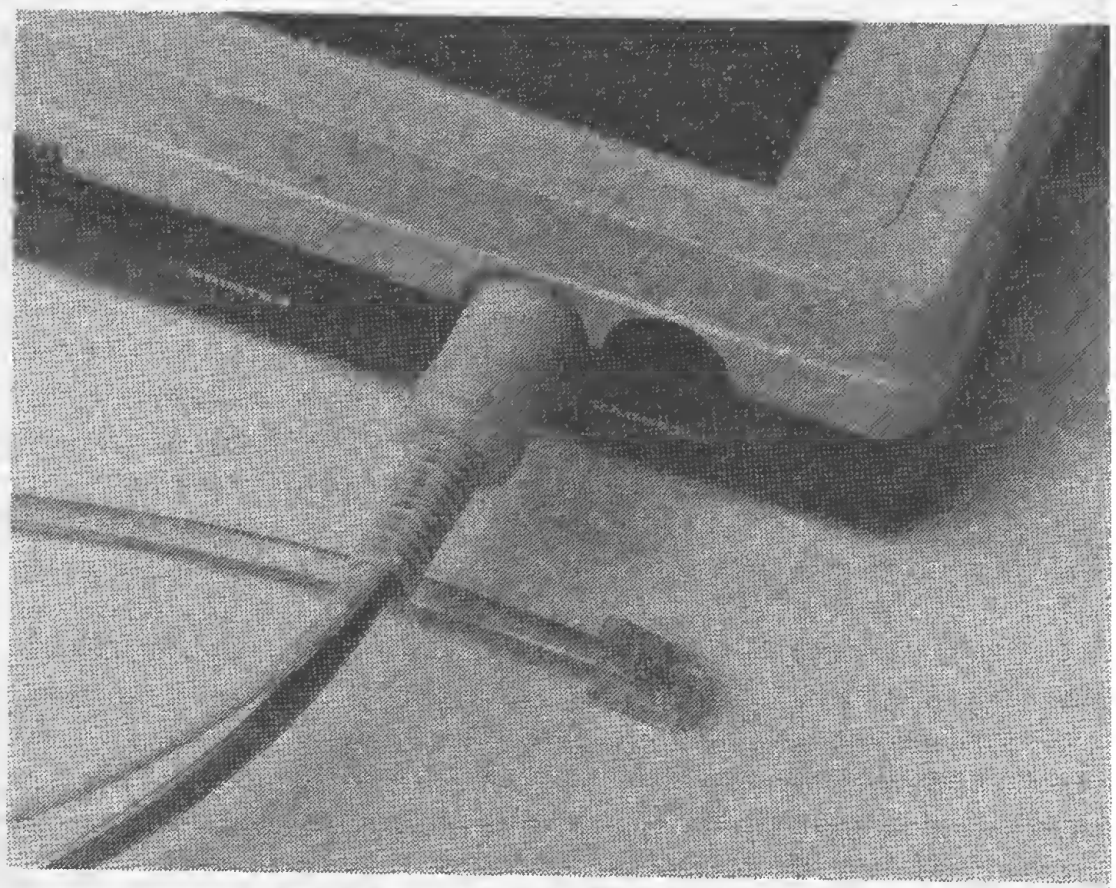


Figure 8.1 Model 100 Modem Cable plugged into the computer

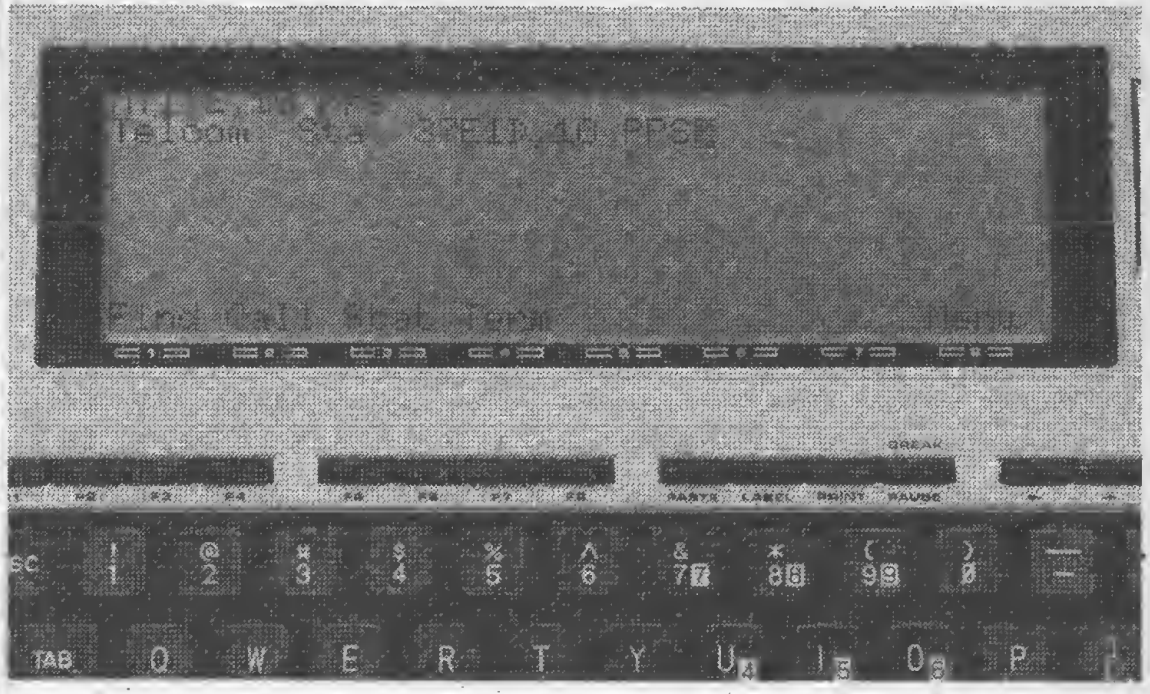


Figure 8.2 The four options of the telecommunications system when *telcom* is selected from the main menu

The Entry and Terminal Modes

When you select the TELCOM option from the main menu of the Model 100, you are automatically in the entry mode of the telecommunications system. You are given a menu at the bottom of the screen that lets you select from four options:

• *Find*. This tells the computer to search for names and phone numbers that are stored in a file called ADRS.DO. We have given you a step-by-step description on using the ADRS.DO system in Chapter Three. You simply type in either the name or number of the party you want to call, and the computer finds that number.

• *Call*. When you have found the phone number, you can press the function key for *Call*, and the computer will automatically dial that phone number for you. To use this option, you have to be connected to a telephone system, of course.

• *Stat*. When you select this option, you are shown some

numbers and letters that make up what is called the *communications protocol*. Different computers use slightly different formats for sending electronic signals across the telephone lines. The particular format a computer uses is called its communications Protocol. You can change the protocol of the Model 100 to make it consistent with any other computer you are trying to communicate with. The *Stat* menu option shows you what the present protocol is and allows you to change it if you need to. Most of the information utility systems use a standard communications protocol, and your Model 100 is already set to that. If you need to change the protocol, you can read a good description of how to do this on pages 85 through 88 of the instruction manual.

• *Term*. After you have found the number you want to dial and have told the computer to dial that number, you can select the *Term* option from the menu. This turns your computer into a smart terminal ready to send and receive information from whatever information source you are connected to.

The entry and terminal modes work together to let you use the computer as a telecommunications system. The entry mode can be used by itself as an automatic dialing system, or it can be used to do the preliminary work of *logging on* to an information source. To log on, you type in the numbers and passwords the information utility requires before you are allowed to use it.

Using the Terminal Mode

When you have established communications with an information source either by dialing the number and logging on yourself or by using the entry mode to log on automatically, you are ready to use the computer as a terminal. When you select the *Term* option, you are shown a new menu at the bottom of the screen. This new menu gives you the following options:

• *Prev*. As you receive information, you can see only eight lines of print at a time. When you want to go back and see

what came just before the information that is presently on the screen, you press the function key for *Prev*, and you will see the previous eight lines. This is just a way of scrolling backwards through the information you have received.

- *Down*. This option stands for downloading. When you are logged onto an information utility and have selected the information you want from the menu, you can select the *Down* option, and that information will be sent, or downloaded, to your computer. Once the information is there, you can save it in memory, save it out on cassette tape, or print it out on a printer.
- *Up*. The *Up* option stands for uploading, which means just the opposite of downloading. You select this option when you want to send information already in your computer to the computer you are in contact with.
- *Full*. This option stands for full or half duplex, two ways of communicating between computers. Most information utilities require that you use full duplex, in which all the infor-

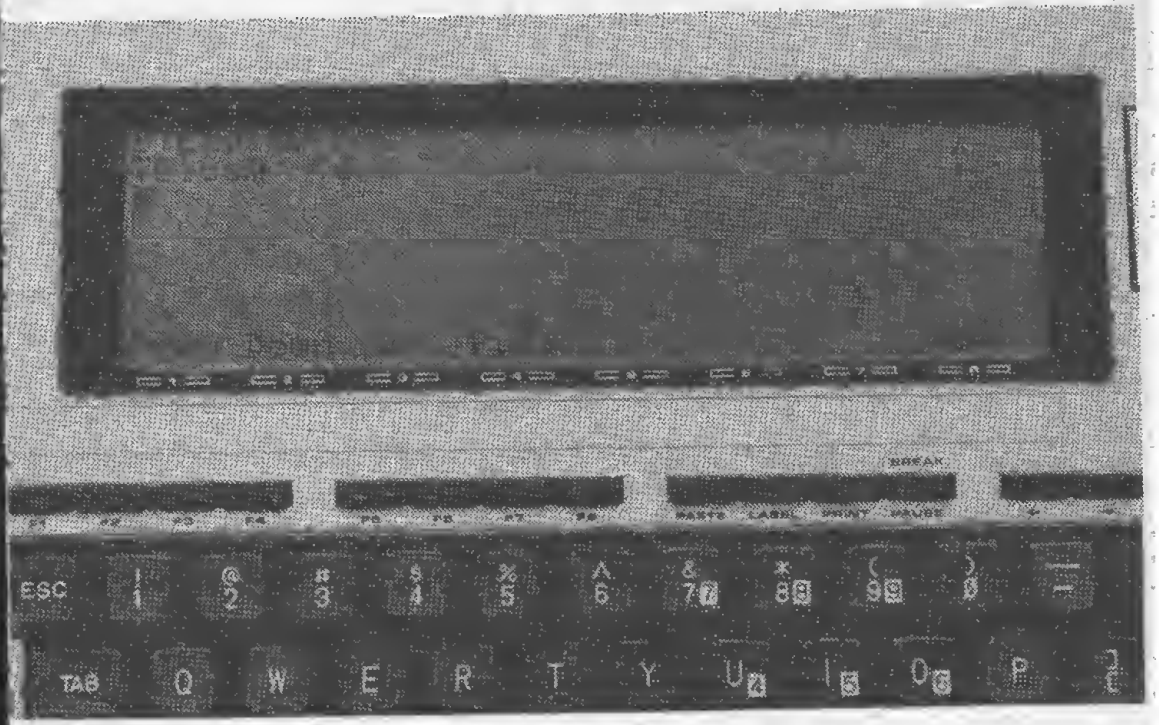


Figure 8.3 When the *Term* option is selected, the new menu gives you the choices displayed at the bottom of the screen.

mation is transmitted, and then you are shown it on your screen (the receiving computer echoes it back). In this way, you can tell if the information was transmitted correctly. When half duplex is used, you see what you are typing on the screen as you type the information, but you are not shown how the information looked after it was actually sent out. In half duplex, if you had a bad telephone connection, and the information you typed was sent incorrectly, you might never know it. In full duplex, you get to see what the computer on the other end received, because it is echoed back to you.

HOW DO YOU SIGN UP FOR AN INFORMATION UTILITY?

There are three main commercial information utilities in common use among Radio Shack computer users.

The Source

There are over 1800 computer dealers around the country who are authorized to sign you up for this service. When you find a dealer who handles it, you can purchase a Sourcepack. In that pack will be a subscription agreement to fill out and mail in. If you cannot find a computer dealer who handles The Source, you can call (800) 336-3366 and get information on how to join. The initial fee for The Source is $100. There is also a $10-per-month fee and then an hourly fee that varies according to the time of day and day of the week you are using it.

CompuServe

You can sign up for this service at your local Radio Shack store by buying a package with all the information you need

to get started. The initial package will cost from $20 to $40 and will contain everything you need to use the system. There is no monthly charge and the hourly rate is $5.

Dow Jones News/Retrieval Services

You can join the Dow Jones system for an initial fee of $50. There is no monthly fee, but you are charged for the time you use the system. This charge varies depending on which part of the service you are using. Radio Shack stores also carry sign-up kits for this service.

TRS-80 BULLETIN BOARDS

One of the most interesting things you can do with telecommunications and your Model 100 is to get the latest information on what other people are doing with their Model 100 computers. You can get such things as free programs that can be downloaded to your computer. You can get information on how to solve certain problems with both hardware and software. You can also find out about a certain piece of software you are interested in buying. You could leave a message asking if anyone has used this program and if it is any good. Later you might take another look at the bulletin board and find that someone has left a message that gives you a complete review of their experience with that specific piece of software.

There are several bulletin boards specifically oriented toward the TRS-80 computers. Forum 80 is one such service, available from B. T. Enterprises. The best way to get access to a variety of bulletin boards is to write to Jim Cambron, P.O. Box 10005, Kansas City, MO, 64111. Jim publishes a directory of bulletin boards and message services for the TRS-80 computer family. CompuServe has a very active Model 100 group that exchanges information and programs.

THE FUTURE OF TELECOMMUNICATIONS

As with many other computer applications, we are only beginning to see what can be done. As the information utility services expand to offer more and better services, your TRS-80 Model 100 will become an even more useful tool. It will be exiting to see what will happen.

CHAPTER NINE

Business Applications

Well, here it is folks: the business chapter. This is what the Model 100 is all about. At least that's what Radio Shack keeps telling us in all their ads. The industry hasn't really been able to make up its mind about what to call the first generation of small, portable computers. Some companies are calling them *notebook-size* computers, others are calling them *lap computers*. Radio Shack calls the Model 100 a *Micro Executive Work Station*. That's a sure indication that they think business is the most important (and most profitable) application.

The Model 100 advertising brochures are definitely aimed at the business market. The pictures are obviously of businessmen (no businesswomen, by the way) using the computer in business settings, on an airplane, and in a hotel room. If you look carefully, you'll notice that the airplane is not a commercial airliner. That's probably because the airlines will not allow you to operate a portable computer in the air.

Be that as it may, even when you discount the considerable hype and hoopla being generated about the Model 100, it does indeed have potential as a business tool. It's truly portable, so it can be taken to meetings and used anywhere, anytime. The built-in word processing program, called TEXT, automatically saves what you type in even if the machine is turned off, so there is little chance that you'll accidentally wipe out important notes. The computer operates on four AA batteries. Even if the batteries run down, data stays in the memory for up to thirty days. The Model 100 has an excellent standard keyboard, making typing a real pleasure.

The machine has a built-in modem and a built-in commu-

nications package called TELCOM. With this combination, you can plug the computer into the telephone lines and use it to dial automatically the telephone numbers stored in the computer's Address Organizer. You can also use the Model 100 as a terminal. You can send data to other computers, receive electronic mail, or check on the Dow Jones stock reports.

The machine has a built-in program for organizing your schedule. It's quick and easy to add, delete, or change entries. You can use the search key to find a specific entry if you can remember any part of it, such as the time or the date. This program can be used as a general filing system for any kind of data.

Micro Executive Work Station may be a bit too strong, but if you're in business, you can probably get some good service from this little computer.

That's the good news. The bad news is that the machine comes with only 8K of memory. That's not really enough to do much. You'll need to add memory and bring it up to at least 24K. The maximum is 32K, and that would really be best. The tab for that would be $405, including installation fees, nudging the total cost of the machine over the $1200 mark.

Note: After the first draft of this book was written, Iota Systems announced 8K RAM modules for the Model 100. Iota charges $85 for 8K, which is quite a bit less than Radio Shack charges.

Also on the minus side is the display screen. You can see only forty characters across the screen and only eight lines at a time. That means it's awkward to do word processing on the Model 100, because you can't make the screen look just like the printout will look. Also, you'll find yourself doing a lot of scrolling to check what you wrote earlier, then to get back to where you left off.

Those are some of the pros and cons as we see them. We've included some of the weaknesses of the computer for one important reason. We think the machine is a bit overrated in the computer magazine reviews we've seen. After you read some of those rave reviews, you might think the Model 100 can do everything from buttering your toast in the morning and

making your second million during the day, to tucking you into bed at night. It won't do all those things. It can give you something to do while you eat your toast in the morning. It can ease your workload a little while you concentrate on making that million dollars. As far as tucking you into bed at night, you'll just have to wait for for the next generation of computers for that. The Model 100 isn't the answer to every businessperson's dreams. Still, it's the best of the computers of its size, it can be useful in business, and it really is a lot of fun!

There are basically two uses for small computers in business: for small businesses and for managerial tasks. Since the Model 100 can't print a payroll or keep an extensive inventory, you probably won't use it to run your small business. However, there are some managerial uses for your Model 100, so that's what we'll concentrate on.

Most of what you do as a manager is concerned with either planning or word processing. If you use your computer for planning, your main concern is projections. You want the answers to questions such as "What will happen if sales increase by ten percent?" The answers to many questions beginning with "What if" can help you make decisions about the future.

PortaCalc

The most useful managerial tool for small computers is probably the electronic spreadsheet. A spreadsheet analysis is tedious if you do it manually. You can avoid much of this tedium by using a computer and an electronic spreadsheet program. Spreadsheet programs are available for nearly all small computers and have very wide use. *VisiCalc* was one of the first such programs for personal computers. This program became popular for business applications and has been adapted for many small computers. Just how useful an electronic spreadsheet will be for use with the Model 100 remains to be seen. The small display screen is a definite disadvantage. Still, a spreadsheet for your portable computer would make it possible for you to take some important business data with you

on trips. That's an advantage worth investigating.

The first version we've seen of a spreadsheet for the Model 100 is called *PortaCalc*, available on cassette from Skyline Software. Program sells for $69.95. It will run only on Model 100s with at least 24K of memory. The program will be most useful with machines with the maximum 32K memory. The rumor is that Radio Shack has plans to market a spreadsheet of its own for the Model 100, but that is still in the planning stage.

Accountants and others who perform financial analyses have been using spreadsheets for a long time. A spreadsheet is simply a printed, rectangular worksheet containing rows and columns of numbers. The form is used because it makes it easier to keep the numbers organized in relation to all others on the form. The simplest basic example of a spreadsheet is a column of numbers with a total.

Now what happens when one of those numbers is changed?

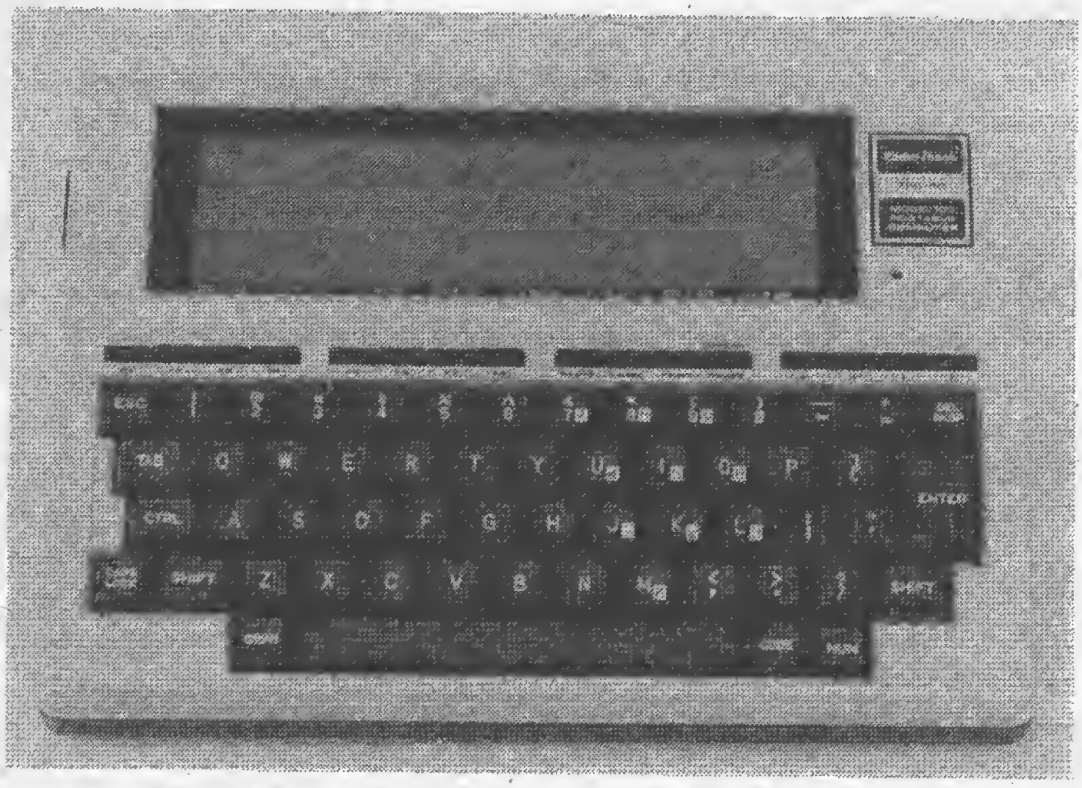


Figure 9.1 Shows the empty PortaCalc screen
(Photographed by Terry R. Haas)

The total is wrong! If you are doing your work by hand, and you change several numbers, you may have to recalculate the entire column. The larger the number of rows and columns on the work sheet, the more complicated it becomes to change any one number. Imagine how many hours of work would be involved in changing and updating a complicated financial forecast!

Electronic spreadsheets simply do the same thing the hand-made spreadsheet does, with the computer doing much of the tedious and repetitive work. In fact, if you have an electronic spreadsheet, most of what *you* have to do is to get the numbers and information into the computer. After that, simple commands can tell the computer to rearrange the information in almost any way you want.

For example, assume that you are a district sales manager for a large company. You have been asked to prepare a sales estimate for next fiscal year that gives three different levels of performance. You supervise twenty-five sales representatives, your company has 350 products that range in price from $3.95 to $225, and you have nineteen discount plans. Your regional manager wants your sales estimate by next week, and you just found out about it today. To make matters worse, you are leaving on an extended business trip and won't have access to the large business computer your firm rents time on. You have two choices: get a Model 100 and *PortaCalc* or get a different job! Believe it or not, you could probably do this complicated sales analysis in just a single afternoon with *PortaCalc*.

How does *PortaCalc* do all this? Your computer screen becomes a window showing you a certain section of a giant spreadsheet made up of 14 columns and 26 rows. That gives you a maximum of 364 cells to work with. This is considerably smaller than spreadsheets for full-size computers. *VisiCalc* for the TRS-80 Model 4, for example, provides 63 columns and 255 rows. That would give you 16,065 cells. The small size of the *PortaCalc* spreadsheet is a disadvantage. Still, something is better than nothing, and we're not sure a bigger spreadsheet would be manageable with such a small display screen. You can see only 4 columns and 6 rows at any one time.

The window on the spreadsheet can be moved around simply by using the direction keys. Or you can move directly to a specific cell by entering a GREATER THAN sign (>), followed by the cell address you want to see. Each row and each column is assigned a letter of the alphabet. The address of each cell is a combination of its column and row location. The first letter of the address is the column location, while the second letter is the row location. That makes it easy to type in the address of the cell you want to see. Cell BE would be at the spot where the second column crosses the fifth row. To return to the upper left hand corner of the spreadsheet (cell AA), press function key F1.

You can enter values (numbers), formulas, or labels into the cells. Labels are needed to identify what the columns and rows stand for. You might enter a different month for each of twelve rows, for example. That would mean, of course, that row A is not available for numbers. You enter formulas in order to manipulate the values you have entered. After you

Figure 9.2 A PortaCalc program being developed
(Photographed by Terry R. Haas)

enter the formula, the program runs the formula on the data as you have directed. For example, you can enter a simple formula that will cause the program to add the value in cell AA to the value in cell AB. If you put that formula in cell AC, the program will do the arithmetic and automatically put the answer in cell AC.

Once you have entered a formula, you never have to enter it again. If you change the value in cell AA, the program must be told to recalculate any affected cells. You do this by pressing the key containing the exclamation mark (!). All formulas will then be recalculated and all values changed accordingly. This can take quite a while, since the program must check more than 300 cells.

You can copy formulas, headings (or titles), and numbers into as many columns as you want. Using our sales estimate as an example, suppose you want to show what would happen if ten of the sales reps had a twenty-five percent increase, and all the others had a five percent decrease. All you have to do is tell the computer to multiply your first results by either twenty-five percent or minus five percent wherever appropriate. The computer performs all of the calculations.

PortaCalc's edit mode is very easy to use. If you want to change a formula, for example, you first move the cursor to the cell containing the formula. Press the / key, and press E for edit, followed by ENTER. The formula will then be displayed on the prompt line at the top of the screen. You can backspace and change it, if you like. When you're satisfied, press ENTER, and the change will be made. You must remember to press the ! key if you want all affected values recalculated.

You can save the contents of any worksheet you make, either in the computer's memory or on a cassette. To begin the SAVE routine, press function key F3. The display will ask if you want to save on *Cas* (cassette tape), on *RAM* (in the Model 100 memory), or ?. If you press the question-mark key, you will be shown all the file names already stored in the computer's memory. This is handy and can prevent you from giving an existing name to your new file and wiping out the

old one. After you tell the program where you want your file stored, you must type in a name. File names must begin with a letter and be no more than six characters long. You may not add an extension to the name.

Loading a file is similar. The computer should first be cleared by pressing /C. Otherwise the loaded file will be added to the one displayed on your screen. That can create a real mess! When you are ready to load a file, press the F2 function key. Prompts are the same as when saving a file.

PortaCalc allows you to choose from zero to seven decimal places for numbers in the worksheet. There are commands to clear specific parts of the worksheet, as well as commands to clear all values while leaving all formulas. Other commands will clear specific rows or columns. The F5 function key prints the entire worksheet, while the PRINT key prints the contents of the display screen.

We have found *PortaCalc* to be a good first effort. It is

Figure 9.3 PortaCalc's utilization of the function key after the *label* key has been pressed
(Photographed by Terry R. Haas)

simple and logical, and the documentation is first rate. It must have been a temptation for the authors to throw together a quick and sloppy manual and get the program on the market as fast as possible. They resisted that temptation, and the manual is extremely well-done. We have found that documentation is so important that we would often choose a less powerful program if it provides better documentation than a more powerful one. *PortaCalc* will probably be enhanced in the future. But it's very good indeed right now!

A program that will do as much for you as *PortaCalc* will take a while to learn. But if you have to do any kind of projections while you are away from your office, your time and effort will be very well spent. Even though you can get started quickly, it will take some practice before you can take full advantage of all of the things *PortaCalc* can do.

Padware Limited has a unique product designed to help you use an electronic spreadsheet more effectively. *CalcPad* ($10.95 for fifty sheets) is a sheet of paper designed to help you plan how you will use your spreadsheet. These sheets can be a big help in getting the most out of *PortaCalc*. We find it interesting that the computer has made paper-and-pencil spreadsheets obsolete, but a paper-and-pencil planning sheet is the next development to help you use the electronic spreadsheet effectively!

Skyline Marketing, the company that distributes *PortaCalc*, also has several other business programs for the Model 100:

PortaStat ($44.95) turns the Model 100 into a statistical analysis tool. You can easily perform many analyses, including correlation, regression, analysis of covariance, and standard descriptive statistics, such as mean, median, and standard deviation.

PortaFin ($44.95) makes it easy to calculate net present value, future value, annuities, internal rate of return, and most aspects of loans, such as principal, interest, and payout period.

PortaFolio ($44.95) allows you to perform many standard technical analyses on stock and bond performance.

PortaMed ($44.95) can be used by physicians as they make rounds in a hospital. Case notes are typed in, and the computer organizes and keeps track of them.

Other Business Software for the Model 100

The Model 100 portable computer is a new product, and software producers have not had much time to produce software. That's changing rapidly, and there will soon be plenty of software for your Model 100. A good source of software is *Portable 100*. This is a new magazine intended specifically for TRS-80 Model 100 users. It's published monthly by the Computer Publishing Company, the same people who publish *The Color Computer Magazine*. Subscriptions can be purchased for $24.95 per year.

80 Micro, another monthly magazine for TRS-80 computer users, also prints programs for the Model 100. There is no charge for these programs, other than the cost of the magazine itself. You simply type the program in yourself. There's a catch, of course—to get the free program, you have to do a lot of typing. That's time-consuming, and if you make errors, the program will not run, or will not run properly if it does run. Nevertheless, there is satisfaction in getting a good program for nothing, even if it takes some effort. *80 Micro* is available for $35.97 for a yearly subscription, and individual copies sell at newstands for $4.

The July 1983 issue of *80 Micro* included a large section on the Model 100, as well as seven programs you can type in yourself. Several of these programs are business-oriented.

One program is called *Traveling Expenses* and was written by Bev Woodbury. This little program (about seventy-five lines) lets you keep a running tally of the cost of any business trip. You can also get a printout at any time. The program keeps track of dates, what you spend for hotels, restaurant, entertainment, and travel of all kinds. It figures the cost of automobile travel by requesting mileage and figuring expenses at twenty cents per mile. You can change the per-mile rate quite easily. This simple program should make it easier to prepare an expense account, and the really handy feature is that the computer goes on the trip with you.

Punch Out is another Model 100 program listed in the July *80 Micro*. This 75-line program was written by Mare-Anne Jarvela and is a conversion of a program by James Conroy. This payroll program tallies timecards and figures payroll deductions. The program requires you to enter the number of times an employee punches in and out, and the exact time for each entry or exit. The program computes the time each employee has worked and reports it in total hours and minutes. After you enter the employee's hourly pay, the computer displays that worker's gross pay. FICA and federal, state, and local taxes are also computed. You can get a printout by changing the PRINT commands to LPRINT commands.

Itinerary 100 is another program in that same issue of *80 Micro*. This is a conversion by Brad Dixon of a program by Ben Gorsky and requires a Model 100 with at least 10K of usable memory. The program stores travel information and payment records. It's long for a type-it-yourself (over 150 lines) but will be a convenience once you have it up and running.

Figure 9.4 The *Traveling Accountant* mini-series

The Final Notice is a conversion by Mare-Anne Jarvela of a program by Walter Atkins. The program notifies you of all accounts due on the first of the month, the fifteenth of the month, and between any other two dates of the month. This program is less than 75 lines long.

A series of business programs will soon be available for the Model 100 from Traveling Software. *Traveling Accountant* is a mini-series, including four programs which will sell for approximately $49.95 each. This series includes *Traveling Expense Manager*, *Traveling Appointment Manager*, *Traveling Project Manager*, *Traveling Communicator*, *Traveling Time Manager*, *Traveling Sales Manager*, *and Traveling Product Manager*. Also available in the near future will be *The Traveling Accountant*, which will include a full-blown general ledger system designed to be used either as a stand-alone system or to feed your office accounting system.

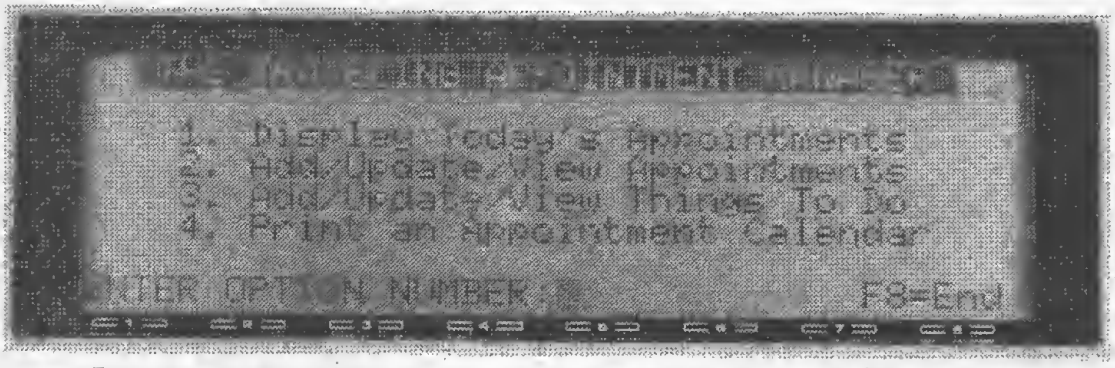


Figure 9.5 The *Traveling Appointment Manager* menu

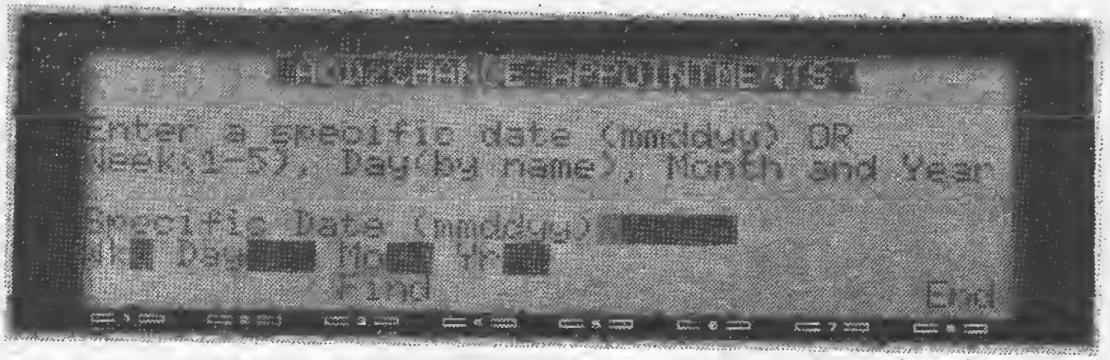


Figure 9.6 You may add an appointment by date or by day in a week, such as "the second Tuesday in October."

The *Traveling Tax Manager* will provide both tax planning and tax preparation. Also included will be a semi-annual newsletter by a tax expert, describing current development in tax law. One of the nice things about programs to help with your taxes is that the cost of the program itself is tax deductible! All programs from Traveling Software will be distributed on cassette tape, and each will include *The Traveling Professor*, with audio cassette instructions on how to use the program on the back side.

Businesspak+ is a $90 package of business programs for the Model 100, available from Portable Computer Support Group. The package includes an enhanced word processing program, a program that helps you keep up with expenses, several utility programs that do jobs like sorting data alphabetically, a program for using the Telex System, and a program that creates bar, line, and pie graphs if you have the DMP-100 printer from Radio Shack.

Bar Code Readers. We noted earlier that the Model 100 has a built-in connector for a bar code reader. This device is commonly used in business for tasks such as inventory control. BT Enterprises sells a bar code system. That includes the reader wand and software for $279.95.

A new book to watch for will be one by Terry Kepner and David Hunpress entitled *51 Programs for the Model 100*. When the book you are now reading went to press, Kepner and Hunpress had not made a definite decision about who the publisher would be. If you're interested in this book, you can write Terry at 28 Pine Street, PO Box 481, Peterborough NH 03458. A second book to be titled *30 Business Programs for the Model 100* is in the planning stage. Titles of some of the programs to be included are *Real Estate Investment*, *Portable Cash Register*, *Expense Account* and *Pricing Margins*.

If you are looking for business software for the Model 100, you can also write software companies and ask for their catalogs. Try Plus Computer Technology, Inc., Computronics Inc., Instant Software, and PMC Software.

CHAPTER TEN

Other Programs For The Model 100

The TRS-80 Model 100 is such a new product that software producers have not really had time to write many programs for it. However, that situation is changing rapidly, and there will soon be many programs available. Watch the computer magazines for ads. In the meantime, some software is available now, and some we know will be available soon. We'll review some of that software in several categories in this chapter.

EDUCATIONAL PROGRAMS

Most parents are interested in helping their children learn. Many people who purchase home computers say they do so because it will help their child do better in school. The Model 100 is not really an educational computer, so if you buy one, it will probably be mainly for some other use. On the other hand, the fact that the machine is portable is a real educational plus. It can be taken to the library or on field trips, and it can be used to take notes in class. It can be used in the car, taken to school, and so on. Your Model 100 *can* be a valuable learning tool for children and adults, and that is the subject of this section.

Just what is it that computers can do to help people learn things? First of all, computers can help by making it quicker and easier to learn things in time-tested ways. In other words, computers can help us continue to learn in ways we have always known to work well.

For example, we have known for many years that one of the most powerful of all learning variables is repetition. Computers obviously have the ability to provide good, methodical repetition for as long as it's needed. And computers can do that without losing patience and making the learner feel stupid.

Another example has to do with giving rewards. One good teaching technique is to provide a quick reward as soon as possible after a learner gives a correct answer. Again, it is easy for a programmer to arrange things so that the computer immediately rewards a correct answer with a smiling face or three minutes of an exciting computer game.

There is nothing really new about the techniques mentioned thus far. The computer is only a new *means* for applying traditional methods. There is nothing *wrong* with using the computer to help us use good, solid, traditional teaching and learning methods. Quite the opposite, in fact. Computers can help provide repetition and quick rewards for many learners. That can give teachers and parents more time to help children with more creative learning, and it can release parents from the frustrating task of drilling their children on spelling words or the multiplication facts.

We think educators and programmers should continue to work on producing and improving traditional uses of computers in learning. But we also believe that the real potential of computers in learning is to provide new and better ways of teaching and learning.

Most of the educational uses of computers are the traditional type. But computers are expensive and take time and effort to learn to use. We believe their use can be justified only if they are used in non-traditional ways as well. If schools purchase computers, they will be used solely to aid learning, and must be highly efficient to be justifiable. For parents who use their computer for many uses, this may not be so important. If the computer is used for business, entertainment, balancing the family budget, and word processing, it doesn't have to prove itself solely as a teaching machine.

Nevertheless, we feel that you should be aware of the differences between traditional and non-traditional educational

uses. And we think you should try to find software of both kinds.

Radio Shack has produced some educational programs, and other companies have produced many for Radio Shack computers. Converting these programs to run on the Model 100 is relatively simple, and software companies are beginning to do this already. There will soon be lots of educational software for the Model 100.

One of the most common criticisms of current educational software is that it fails to use good principles of teaching. That happens because good computer programmers usually know little or nothing about teaching. And people who know how children learn best usually don't know how to write computer programs.

Some software companies try to solve the problem by arranging for large companies who specialize in educational materials to design a series of lessons which computer programmers then write in computer language. In the past, Radio Shack has not used this technique extensively. They have now decided to move in this direction and a spokesman at Radio Shack indicates they currently have contracts for software development with thirty-three large educational publishing houses. D.C. Heath, McGraw Hill, Southwest Publishing Company, and Random House Publishing Company are among them. This makes it more likely (but does not guarantee) that educational programs will be educationally sound. The series concept helps prevent educational software from being a large number of isolated, one-shot offerings that lack continuity. We applaud Radio Shack's intentions.

Traditional Educational Applications: Drill and Practice and Tutorial Programs

The simplest type of computer use in education is *drill and practice*. Drill and practice programs don't really teach you anything new, they just give you practice in something you learned in some other way. A common drill and practice pro-

gram is one that gives the student practice in using basic math skills. There are many of these programs for every home computer. Watch the magazines if you want one for your Model 100.

A *tutorial* program does more than just give you practice on something you already know. It actually teaches. At the present time, drill and practice programs are much easier to find than tutorial programs. Thumb through any computer magazine, and you will find many different types for many subject areas. We'll include a list of companies you might want a catalog from later in this chapter.

Typing Teacher

Instant Software produces *Typing Teacher* for the Model 100. This tutorial program sells for $17.95 on cassette and is designed to teach you to type. It will run on Model 100s with at least 16K of memory. This excellent program does a good job of teaching typing to anyone who is old enough to read the screen displays.

The program comes in seven parts. The introduction presents the home keys and begins with an excellent graphic that shows the *asdf jkl;* keys. A code system under each letter shows you which finger to place on each key. When you are ready to proceed, you press ENTER. You are then told how to place your thumbs above the space bar. When you press ENTER again, you are told that in each typing session, a line of letters or groups of letters will be displayed. You are to type the letters exactly as shown. The computer will check your typing and print a question mark under any mistyped letters.

The computer then displays a row of letters and combinations of letters, using only *asdfjkl;*, and you type them in and press ENTER. An interesting feature of the program is that errors cannot be corrected. That keeps you from glancing down at your hands or worrying about whether you are right or wrong. The objective is to keep you typing while looking at the screen. After you press ENTER, the program displays a question mark under any mistakes you made. If you were

correct, the computer displays another line of letters for you to type.

When you have finished typing five different lines, the program will ask you if you would like to repeat the lesson. If not, you are returned to the main menu to select another lesson.

Lesson Two is in two parts. Part One presents twenty drills on letter combinations using the home keys and the row of keys above. Part Two is similar but has you typing actual words instead of letter combinations that don't make sense. We like that better. It's much easier to type real words than nonsense! Lesson Three introduces the bottom row of keys and teaches you which fingers you should use to strike them. There is more drill, this time mostly with real sentences. Lesson Four introduces the number keys and provides drill. Lesson Five introduces the special characters accessed by striking the number keys while holding down the SHIFT key and provides you with drill using those keys. Lesson Six presents more drill on special characters, drill on commonly used words, and turns the computer into a very simple word processor called *The Bottomless Page*. This lets you type material of your own choosing for as long as you like, providing typing practice.

This is an excellent, inexpensive typing tutor. There are no diagnostics or opportunity to measure your typing speed, however. We like *Typing Teacher* because it provides lots of drill in the early stages. If you want to learn to type, you can do so with this simple program. The price is right and we recommend it highly.

Math Hangman

Math Hangman is a free drill and practice program by Tim Knight, a sixteen-year-old high school student. The program is listed in the *80 Micro* Anniversary Issue, 1983. As we have already explained in this book, most computer magazines print free programs from time to time. If you are willing to type them in, you can get some very useful programs for only the cost of the magazine.

Math Hangman is less than 100 lines long and is very much worth the short time it takes to convert it for the Model 100 and type it in. The program gives you the choice of practicing simple addition, subtraction, multiplication, or division problems and lets you specify how many problems you want. If you ask for more than fifty problems, you will be told "Wow, I think that's a little too much!" If you ask for six or fewer problems, the screen displays "Aww, you can give it a better shot than that!"

As each problem is displayed, you enter your answer. If you're right, you're told you're right and given the next problem. If you're wrong, you're told you're wrong, and a piece of the hangman appears. If the hangman is completed (by missing six problems), you lose the game.

When the game is over, you are informed of how many problems you got right, how many you got wrong, and the percentage of correct answers you gave.

This is an excellent little drill and practice program you can get free. Children of about ten or older can sometimes type this program into the computer themselves. We recommend that. It exposes them to some programming and illustrates that programming can be fun.

Non-Traditional Educational Applications

Computers like the Model 100 also provide new and better ways of teaching and learning. These include teaching the child to program, simulations, and using word processing to improve writing skills.

Children can learn to do some programming in BASIC. The fact that the child can take the Model 100 with him or her everywhere may provide some extra motivation for learning to program. Learning to program may help children think logically and analytically.

The programs for other TRS-80 computers that help teach BASIC programming will undoubtedly be converted for the Model 100 in the near future. If you want to learn BASIC, we recommend you look into these tutorial programs.

Simulation Programs

Simulations enable learners to gain experience or training doing something without taking part in the real-life activity, especially if it's expensive or dangerous.

Many good simulations are available for the TRS-80 Model III and 4 computers. There is every reason to believe that some of these will soon be converted for use with the Model 100, since many are written in BASIC, and the Model 100's BASIC is similar to the BASIC in the Model 4.

There are a variety of simulation programs related to flying. Most of these display the instrument panel of a light aircraft and allow you to control various maneuvers such as take-offs and landings. Other simulations we have seen recently let you take the role of an air traffic controller, the dispatcher in a large long-haul trucking company, the dispatcher in charge of sending out forest fire fighters, a substantial stock market investor, or the campaign manager for a presidential candidate.

Simulation programs are difficult to write, and good ones are scarce. We hope to see more use made of this promising area of computer education.

Word Processing Programs

Another educational computer use is word processing programs. The Model 100 has a good built-in word processing program. We explain how to use this program in Chapter Two of this book.

Children or anyone who wishes to improve their writing skills can profit from word processing. The fact that the Model 100 is a portable computer makes this an even more attractive possibility. Word processing makes the mechanics of revision easy and encourages you to experiment.

To benefit the most from word processing, you need to be at least a fairly good typist, so we recommend a good typing tutor like the one reviewed in this chapter.

Educational Software Sources

We have explained educational uses for home computers and reviewed some software. Some magazines you may be interested in include *Computers in the Schools*, *The Computing Teacher*, and *Educational Computer Magazine*.

Books of interest include *Computers, Teaching and Learning* by Willis, Johnson, and Dixon a (dilithium Press book, 1982), and *The Computer in the School: Tutor, Tool, Tutee* (Columbia University Press, 1981), edited by Robert P. Taylor.

Some publishers of educational software will send you a catalog if you request it. Try Britannica Computer Based Learning, PMC Software, CLS Associates, Precision People, Inc., and Bertamax Inc.

Another handy way to find educational software is by consulting the Radio Shack *Educational Software Sourcebook*. This thick sourcebook lists thousands of programs of every type. Your Radio Shack store should have the latest copy.

Our final suggestion is that you consider joining the *Educational Software Library*, a nonprofit organization that operates by mail-order. They buy, evaluate, and rent a large number of TRS-80 educational software. You can join for $25 for one year. In return, you will receive a catalog of software (with reviews) and a bimonthly newsletter containing a list and reviews of new software. Best of all, you can borrow any software from the Library for $2 per program. If you want the review catalog but aren't interested in parting with $25 for a membership, you can purchase it for $4.95.

GAME PROGRAMS

While it's true that computers can be useful for a rapidly growing variety of tasks in the home, it's also a fact that they are most often used for game-playing. Computer magazines

and software catalogs are overflowing with ads for game software.

That's not hard to understand, when you consider the popularity of arcade games that cost a quarter to play. They're everywhere you go these days: grocery stores, convenience markets, restaurants, malls!

Several computers can run games strikingly similar to the arcade games. Some experienced gamers even *prefer* some of the better small computer games over the coin-operated arcade games. The fact that home computer games are becoming so good is quite an accomplishment, in light of the fact that arcade games often cost $3800 and use a screen that is custom-designed for a single use!

There's good news and bad news about playing computer games on the Model 100. The good news is that you can definitely have a lot of fun playing games on your Model 100. The bad news is that the TRS-80 Model 100 is not one of the computers capable of rivaling arcade games.

The primary reason that game-playing on the Model 100 does not measure up to some other computers, like the Texas Instruments 99/4A, the ATARI, or the Apple, is that the computer itself was not designed for gaming. Computers that are excellent for games have the ability to produce very high-quality color pictures (called *graphics* by programmers). Anyone who has played the arcade-like games knows that much of their appeal lies in their colorful, imaginative graphics and noisy sound effects. The Model 100 can produce graphics, of course, and it has built-in sound. However, the screen is very small, and the computer does not have a color display.

Not all computer games rely on color graphics, and you can buy an accessory that allows you to plug your computer into a television set to get a bigger display. But if playing games is your *primary* reason for wanting a computer, the Model 100 would not be your best choice.

We will explain computer gaming in the following categories: action games; fantasy games; simulation games; card games, Las Vegas-style games and board games; and sports games.

Action Games

Some of the most popular of all computer games are the action games. Most people are familiar with them because most arcade games are action games. The violence in some has been criticized by people who fear that playing the games can lead to increased violence in real life. That may or may not be true. We simply do not have the evidence to determine what effect playing action games might have on children.

Actually, there are several subtypes of action games. The most popular type pits your spaceship/missile base/tank against hordes of attacking enemy ships/creatures/tanks. Zapping alien spaceships or blasting asteroids is what these games are all about.

In other types of action games, you guide race cars around a track or play tennis or hockey. The lack of intricate color graphics and the 8-line display on the Model 100 computer makes it poorly suited for action games. Some action games will be developed for the Model 100 in the future, although action games are not one of this computer's strengths. If you want action games for the Model 100, you might try *Blocade* from Silverware. This is one of four games on a cassette; the three others are *Reversi*, *Frankenstein Adventure*, and *Alexis Adventure*. The cassette is $25.95.

Fantasy Games

Fantasy or adventure games seem to be gaining in popularity. This type of game has the same heritage as the popular Dungeons and Dragons game, which was originally a loosely structured game played entirely without a computer. The game became popular on college campuses in the late seventies and soon spread to high schools and even elementary schools. When fantasy or adventure games were first played on computers, large university computers (called *main-frame computers*) were

used. Later, when relatively large memories became available on small computers, such games were written for micro-computers. The Model 100 is not a good computer for action games, but it will do nicely for many of the fantasy or adventure games.

Fantasy or adventure games usually don't depend on fast action, laser guns, or attacking space ships for their appeal. Instead, they depend on the story line and require thoughtful strategy and imaginative problem-solving. Wizards, trolls, and other magical beings inhabit these games, which tend to appeal more to older children or adults.

Most of the early fantasy or adventure games were text-only games. They used no graphics, and the player actually read the entire game, selecting certain options as the game went on. Text-only games are available for most microcomputers. The pace is so slow, a complete game can take days, weeks, or even months to complete. An interesting feature of most of

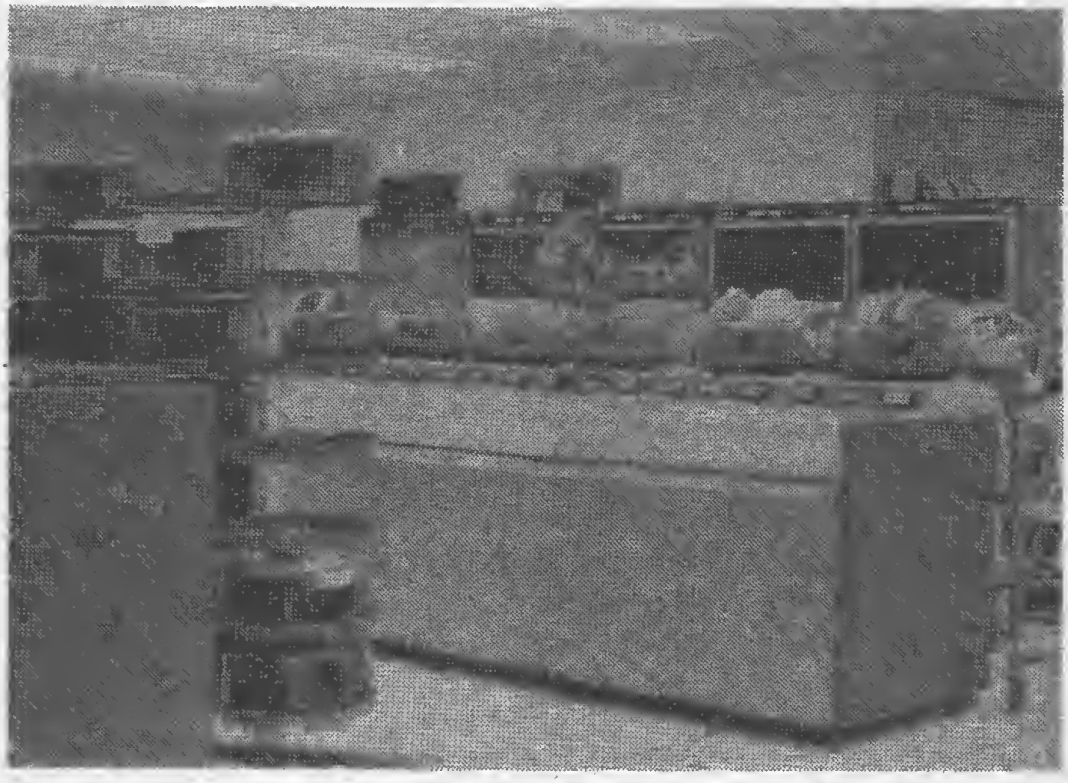


Figure 10.1 Mainframe Computer System

these games is that they can be saved on cassette or disk at any point. Later, the player can enter the game where he or she left off.

A good example of this type of game is the popular series from Adventure International. Many of these games were written by Scott Adams, one of the first authors of adventure games, and one of the most popular is called *Pirate Adventure*.

Pirate Adventure

In *Pirate Adventure*, you are searching for Long John Silver's treasure. The treasure is hidden somewhere on a strange island, and you must search the island for clues to its whereabouts. Once you find a map of the island, you can begin using some of the items you have been given to help you find the treasure. This is a text-only game—there are no graphics. As you move through the adventure, the screen will tell you what is happening to you. Obviously, you have to be able to read to enjoy this adventure, so the game is not for children who can't read. You move about the island by issuing a series of two-word commands such as LOOK TREES (for *look in the trees*). The computer will respond with answers, such as "*I see something in the shadows.*" The twelve-game series includes games for beginners, for those with moderate skill, and for advanced players. *Pirate Adventure* is for beginners. However, text-only adventure games require logic and patience beyond most children (and many adults) and are really not well-suited for most children younger than thirteen or so. Since the Model 100 can run text-only adventure games with no problem, we expect many games like *Pirate Adventure* to be available for it.

Other companies selling adventure-fantasy software for TRS-80 computers include Epyx, Nelson Software Systems, and Med Systems Software.

Monsters and Magic

Monsters and Magic is another fantasy-adventure game. It is written especially for the TRS-80 Model 100 with at least

24K of memory. The game is a typical *hack-and-slay* fantasy and is available on cassette ($19.95) from Prickly Pear Software.

The object of the game is to defeat as many monsters as necessary to reach and defeat the Lord of the Dungeon. There are over fifty monsters programmed into this fantasy, and it takes some thoughtful strategy to reach the Lord and defeat him. This is a typical fantasy-adventure.

Simulation Games

Simulation games are designed to mirror real-life experiences like flying an airplane or running a large corporation. Some computerized simulations actually do prepare people for a real experience, such as flight simulators used by the Air Force or NASA, while others are purely for fun. We have already described some simulations in the educational chapter. One of the interesting new simulations written especially for the Model 100 is called *Viking*.

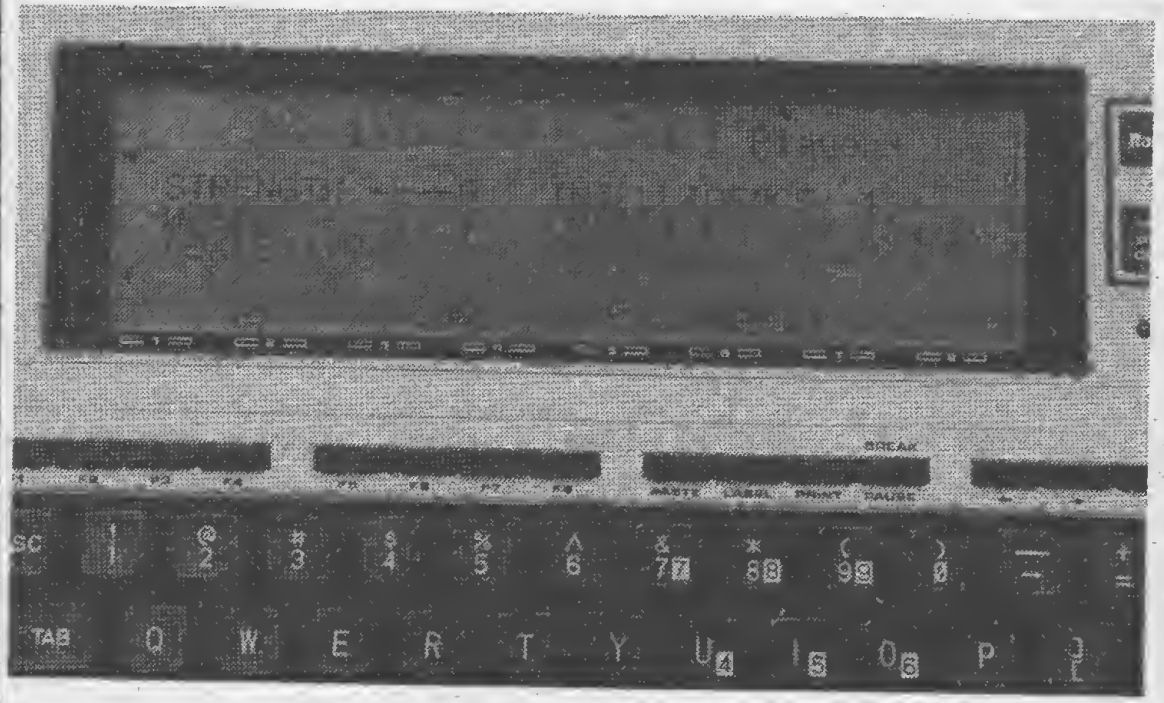


Figure 10.2 ***Monsters and Magic***

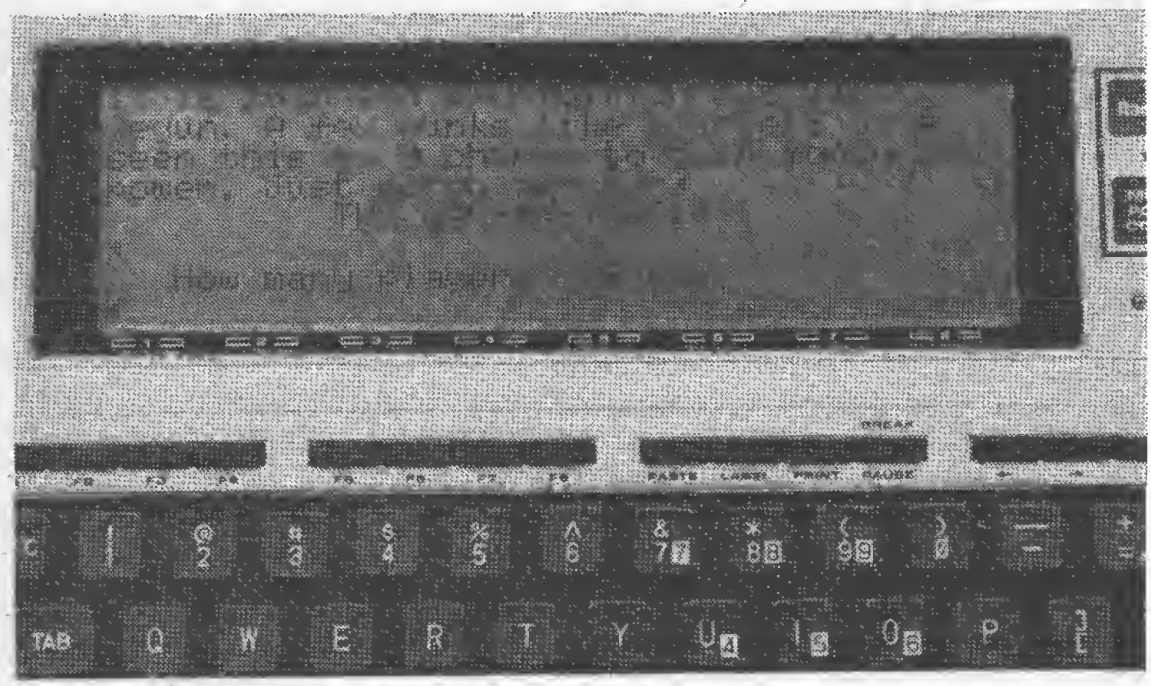


Figure 10.3 The *Gangbusters*

Viking

This creative simulation is also from Prickly Pear Software. It runs on a Model 100 with at least 24K of memory and sells on cassette for $19.95.

Viking simulates running a country in the Middle Ages. From one to four people can play this game. The object is to become King by controlling most of the country's economic resources. Players buy and sell land, crops, and fishing fleets, while attempting to avoid plagues and wars. Direct control of 40 variables is possible, while 100 more are indirectly controlled or are under random control.

Gangbusters

This is a tongue-in-cheek simulation of running a big-city criminal organization. This is another game from Prickly Pear Software and is available on cassette tape for $19.95. You'll need a Model 100 with at least 24K of memory to play *Gangbusters*.

From two to six players can take part. The object of the game is to move from being a punk all the way to becoming

syndicate boss. You can put out contracts on the other players, take over labor unions, buy trucking companies, play the horses, and buy and steal limousines. You must avoid going to jail or being knocked off by one of the other players.

There are many other, more traditional simulation games for small computers. Instant Software sells a number of such games and they have plans to convert several for the Model 100.

Card Games, Las Vegas-Style Games and Board Games

These programs are readily available from a variety of software vendors and are a staple of computer gaming. Some provide you with an opportunity to play the game, while others serve a training function. Others do both. Since these games do not use fast graphics and don't need a color display, they will soon be available for the Model 100.

Programs that allow you to play blackjack, craps, Keno, slot machine, poker, and Baccarat have already been developed for other computers.

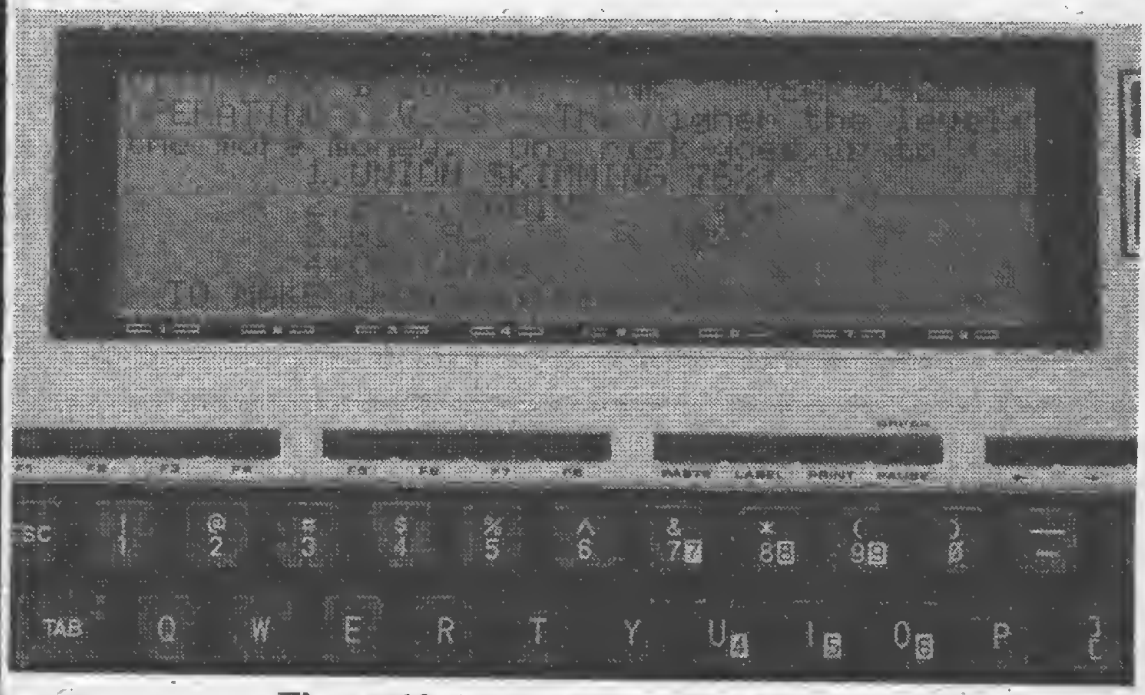


Figure 10.4 The *Gangbusters* menu

Another staple of computer gaming are programs that emulate the various board games. The chess programs are well-developed, although no one has yet managed to come up with a chess program that is equal to a true chess master. We'll have to wait and see whether chess programs will be developed for the Model 100. Backgammon, Monopoly, Scrabble, and checkers are also good bets in this category.

Sports Games

There are many sports games available for computers. Most of these games are suitable for both children and adults, but they do presuppose a knowledge of the rules of each game. Prickly Pear Software has a football game for the Model 100 on the drawing board.

If you're interested in sports games, check also with Avalon Hill Microcomputer Games.

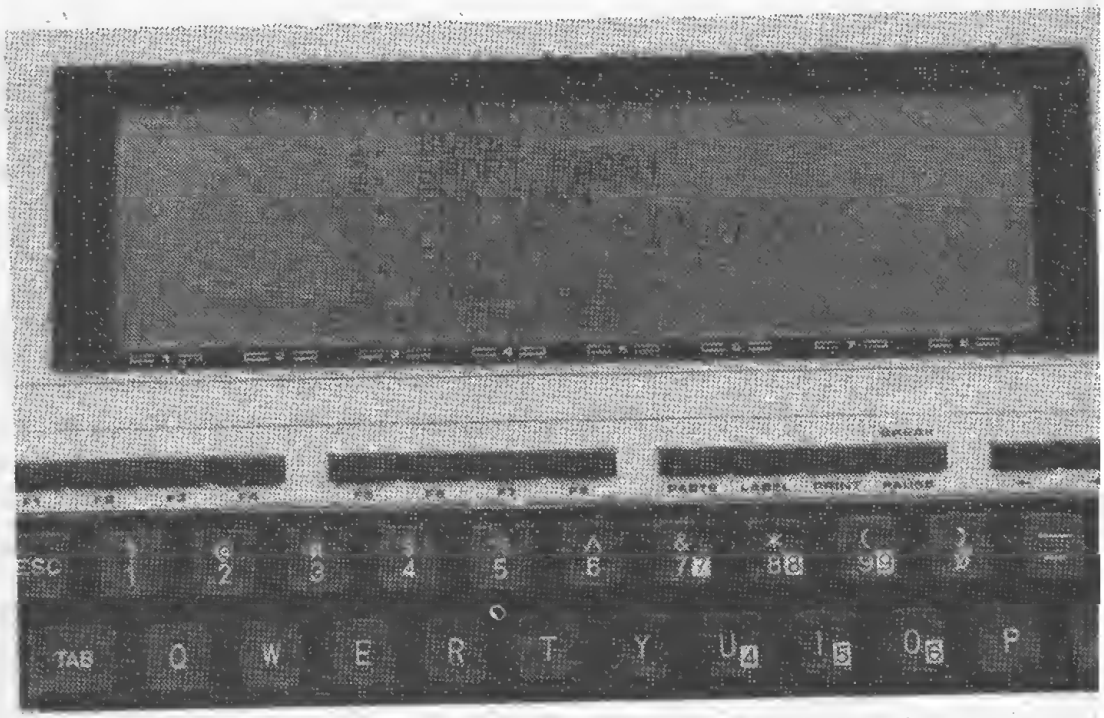


Figure 10.5 ***Football***

Where Else to Look for Game Software

Probably the best way to find good new game software is to read some of the computer magazines. They carry advertisements and reviews for many games. One of the best magazines for TRS-80 owners to subscribe to is *80 Micro*. It is published monthly and costs $35.97 per year. Another good magazine is *Basic Computing*, also published monthly. This magazine is available for $16 for one year or $31 for two years. These magazines carry regular reviews of game programs for the TRS-80 computers.

There are two new magazines for portable computer owners. One is *Portable 100*, available for $24.95 per year. The other is *PCM—Portable Computing Magazine*, available for $23 per year from Rainbow. Both of these publications print programs of all kinds for the Model 100 as well as reviews of commercial software.

HOME FINANCE, RECORD KEEPING, AND HEALTH CARE PROGRAMS

Most people don't buy a computer specifically for the uses described in this section, but for other reasons like word processing, telecommunications, and playing games. The computer is generally acquired with one purpose in mind, and then its owner begins looking for more ways to use it.

The magazine *Interface Age* led the way in describing home applications of the microcomputer. Their December 1977 issue contains two articles by Francis Ascolillo on a *Household Finance System*. Written in MITS BASIC, the program can provide your family with an overview of spending and earning patterns. It allows the person who writes your family checks each month to simultaneously provide the computer with the data needed to do an analysis. You can also get monthly and

yearly printouts on spending patterns and predicted trends. The same issue has a personal accounts payable program by Kevin Redden, also written in BASIC. With it you can keep track of bills received, payments made, and information like time between receipt and payment, minimum payment due, total amount owed on each account, and interest paid on each account. These BASIC programs can be adapted for your Model 100, or you may purchase similar programs written especially for it.

In addition, *80 Micro* often publishes the kind of program you can type in and use free (or for the cost of the magazine).

A growing number of programs help home computer owners with personal financial decisions: budget control, financial planning, checkbook balancing, analysis of loan options, and filing income tax forms.

Loan

One such program is called *Loan*. This program originally appeared in a book called *32 BASIC Programs for TRS-80 (Level II) Computer* by Tom Rugg and Phil Feldman (dilithium Press). It was adapted for the Model 100 by Brian S. Carman and is listed in its entirety in Chapter Seven of this book.

Loan will run on any Model 100, even the 8K version. You must type in the amount, interest rate, and number of payments of any loan you are considering. *Loan* will display, for each month, the amount of your payment devoted to both interest and principal. It also displays the total cost of the loan.

Biorhythms

Biorhythms is a BASIC program written by E. J. Louis and sells for $25 on cassette. Starting with a menu, this program asks you to type in your date of birth and the present date. It then shows you a typical biorhythm sine wave for the physical, intellectual, and emotional aspects of your present state. It indicates when you are within safe limits and when you are pressing the line. If you like to keep track of your biorhythms, here is a way to have your Model 100 give you a report each day.

Other Software

There are good programs already available for the TRS-80 Model III and 4 computers to help you keep track of discount coupons or refund offers, manage your family budget, compute your income tax, organize and maintain an electronic file, analyze and improve family nutrition, and help you set up a jogging program. Many of these programs will probably be converted for Model 100 use. If you're interested, try writing for catalogs of Model 100 software from Kensoft, BV Engineering, Micromatic Programming Co., Triple-D Software, Hexagon Systems, Software Options, Inc., Quant-m Corp., and NODVILL Software.

ARTS AND CRAFTS PROGRAMS

The Model 100 is not really a good computer for arts and crafts because it is limited by the lack of color and the small screen. Nevertheless, there are some arts and crafts applications.

Fake List

A program called *Fake List* can be an aid to any musician. Musicians have traditionally used a fake list system when they have had a large number of different tunes to keep track of. The fake list system is nothing more than an abbreviated version of each song, listed alphabetically. Each listing includes the title, the key the song is to be played in, the starting note, and the chord symbols.

Fake List works just like the traditional fake list system, except the information is stored in the Model 100 computer. When the name of a song is typed in, the information for that song appears on the screen. This program simply takes advantage of the Address Organizer program built into the Model

100. Instead of names and addresses, you type in names of songs and enough of the essential information to get started playing. *Fake List* was written by E. J. Louis and sells for $25 on cassette tape.

We hope this book has been helpful in introducing you to the field of personal computing and to the TRS-80 Model 100. There is much more to learn, of course, but much of what you need to know to use the computer effectively has been covered in the last ten chapters. We hope you find many uses for the computer and spend many productive, enjoyable hours at the TRS-80 Model 100's keyboard.

Happy Computing!

Glossary

Address: Main memory in a computer is like a grid of thousands of indivual boxes. Each memory location (or box) is called an address.

Alphanumeric: Information presented in both alphabetic and numeric form, for instance a mailing list. The numbers 0-9 and the letters A-Z or any combination.

Applications software: Programs designed to perform specific tasks. Applications software can be games, educational programs, or business programs.

Arithmetic expression: A group of letters, numbers and/or symbols that tell the computer to perform an arithmetic function. For example:

2+2
2*2
A22
2/4
2/A
A* (2/B8)

Arithmetic operator: A symbol that tells the computer to perform an arithmetic operation. The operators include + addition; − subtraction; * multiplication; / division; and ^ raise to a power.

ASCII: A simple code system that converts symbols and numbers into numbers the computer can understand. For instance, when you type *a* on the keyboard of your computer, the binary number 01100001 is sent to computer's central processing unit (CPU). The CPU then displays the letter *a* on the screen.

Assembly language: A low-level programming language that is much faster than a high-level language such as BASIC.

Assembly language programs are extremely difficult to write. Here are two lines from an assembly language program:

```
LDA
MOV C,A
```

BASIC: Beginner's All-purpose Symbolic Instruction Code. A high-level computer language designed for beginners. TRS-80 Model 100 BASIC is a dialect of BASIC designed especially for the TRS-80 Model 100 microcomputers. Here are four lines of a program written in BASIC:

```
10 PRINT "HELLO HOW ARE YOU?"
20 DIM A$ (10)
30 INPUT A$
40 GOSUB 500
```

Baud: A unit of information transfer. In microcomputers, a baud is one bit per second.

Baud rate: The rate at which information is transferred. For instance, 300 baud is a transfer rate of 300 bits per second. The TRS-80 Model 100 computer is an 8-bit computer. This means that each character, space or symbol requires 8 bits. Therefore, a baud rate of 300 transfers only 37.5 characters per second. If you are sending a letter with each word approximately six characters long and you have one space between words, you can send about five words a second or 300 words a minute.

Binary number: A number system that uses only two digits, 0 and 1, to express all numeric values. See digital computer.

Bit: The basic unit of computer memory. It is short for binary digit and can have a value of either 1 or 0.

Black box: A piece of equipment that is viewed only in terms of its input and output.

Boot: The process of loading part or all of the disk operating system into the computer. This lets you load information from the disk or save information to the disk.

Break: To interrupt execution of a program. The TRS-80 Model 100 computers have a key labeled BREAK.

Buffer: A temporary storage place used to hold data for further processing.

Bug: A problem that causes the computer or a computer program to perform incorrectly or not at all.

Bus: A set of connection lines between various components of the computer.

Byte: A group of eight bits usually treated as a unit. It takes one

byte to store a unit of information. For instance the word *love* requires four bytes.

CAI: Computer-Aided Instruction

Canned software: One or more programs that are ready to run "as is."

Cartridge: A 2x3x3/4-inch plastic box that contains ROM software such as BASIC.

Cassette: A small plastic cartridge that has magnetic tape inside. It has two reels. The tape on one reel is wound onto the other reel. Computer programs can be stored on a standard audio cassette.

Cassette drive: A standard tape recorder used to save (record) or load (retrieve) computer information.

Cathode Ray Tube (CRT): The picture tube of a television set or monitor. It is used to display computer output.

Central processing unit (CPU): This is the heart of the computer. It contains the circuits that control the execution of instructions.

Chip: A formed flake of silicon or other semiconductor material containing an integrated circuit.

Circuit: The complete path of an electric current. A computer circuit may have thousands of different elements, i.e., transistors, diodes, resistors, etc.

Circuit board: A plastic board that has hundreds or even thousands of different circuits.

Clock: An electronic circuit in a computer that is the source of timing and synchronizing signals.

Code: A system of symbols and rules for representing, transmitting and storing information.

Coding: Writing a computer program.

Command: An instruction that tells the computer to perform an operation immediately. The command *RUN*, for instance, tells the computer to begin immediately executing a program.

Compiler: A computer program that translates high-level language statements into machine language.

Computer-Aided Instruction: The process of teaching by computer. This is a system of individualized instruction that uses a computer program as the learning medium.

Console: The keyboard and other devices that make up the control unit of a computer.

Control key: Pushing the computer's control key in conjunction

with another key causes the computer to perform special functions.

Controller: A device that can be attached directly to the computer or to an external mechanical device so that images on the screen can be moved around. A joystick is a controller.

CP/M: An operating system that runs on many different computers.

CPU: Central Processing Unit.

CRT: Cathode Ray Tube

Cursor: The little flashing white square on the CRT that indicates where the next character will be displayed.

Daisy wheel printer: A printing machine whose print head has a number (usually 96) of radial arms or petals. Each petal has a type character on the end. Daisy wheel type is equal to or better than most typewriter type.

Data: All items of information a computer can process or generate—numbers, letters, symbols, facts, statements, etc.

Database: The entire collection of data in a computer system that can be accessed at one time.

Database management system: A program that organizes data in a computer's data storage so that several, or all, programs can have access to virtually any item, and yet a particular item need be keyed into the computer system only once.

Data processing: The process of converting data into machine readable form so the computer can work on it.

Data transmission rate: Baud rate

Debug: To eliminate errors in a computer or a computer program.

Decimal number system: This is the number system you are familiar with, that is, 0-9.

Default: See default value.

Default value: An assigned quantity for a device or program that is set by the manufacturer. For instance, a printer may have a default value that tells it to print everything in elite type. A default value in a program is usually the most common or safest answer. As another example, a word processing program may ask if you want to clear everything in memory. The safest answer is no, since it doesn't cause any harm if you hit the wrong key. In this example the program would have a default value of no.

Desktop computer: A complete computer system designed to fit on a desktop.

Device: Any piece of computer equipment.

Digital: A system that uses the numbers 0 and 1 to represent variables involved in calculation. This means that information can be represented by a series of offs (0) or ons (1). See bit.

Digital computer: A computer that uses a series of electronic offs and ons to represent information. These offs and ons are converted to (or from) binary numbers. The TRS-80 Model 100 is a digital computer.

Directory: A list of all the files on a diskette.

Disc: Disk

Disk: A piece of flat rotating circular mylar that is coated with magnetic material. It is used to store computer information. See also hard disk and diskette.

Diskette: A flexible disk that is 5 1/4 inches in diameter (about the size of a 45 RPM record). It is the most common mass storage device.

Disk drive: An electromechanical device that stores on or recalls information from a disk.

Disk file: An organized collection of data stored on a disk.

Disk operating system: An operating system that let's a computer use one or more disk drives. See operating system.

Documentation: All of the available information about a particular computer, computer program or set of programs; it would include instructions on how to turn on the computer, how to load programs, and so on. For computer programs, the documentation should include such information as what type of computer the program runs on, how much memory is needed and how to operate the program. The TRS-80 Model 100 comes with an owner's manual. The manual includes instructions on how to use TRS-80 Model 100 BASIC.

DOS: Disk Operating System

Dot matrix printer: A printer that forms characters as patterns of dots. The dots lie within a grid of definite dimensions, such as 5x7 dots.

Dual density: A technique of writing twice as much information on a diskette.

Edit: To make changes on the screen in data or a program.

Electronic mail: Personal or other messages generated on computer and transmitted to another computer at a different location. The computers are connected by phone lines.

Execute: To operate a computer program or part of a computer program. The process a computer goes through when it analyzes instructions and acts on them.

Expression: A combination of numbers, variables and operators that can be evaluated. The answer must be a single number or variable. For instance, 2+3=5. It can't equal 7. Other expressions such as A+B, A-3 or A/B*38 must also have only one answer.

External memory: Mass storage.

Field: A unit of information that is part of a file. For instance, in the following mailing list file, NAME, ADDRESS, CITY, STATE and ZIP are all fields:

```
SAMPLE MAILING LIST
NAME_____________
ADDRESS_____________
CITY_____________
STATE_____
ZIP_____
```

In the example above, both the information and title are part of a field. For instance, the field for Joe Jones is this: NAME Joe Jones.

File: An organized collection of related records. A payroll file has a complete payroll record for each employee.

Floppy disk: Diskette

Formatting: The process of electronically organizing a diskette so that information can be stored on it and retrieved from it.

Fortran: FORmula TRANslation. A high-level computer language used for mathematical or engineering applications. Here are three lines from a FORTRAN program:

```
40 FORMAT (E14.7)
X=A+B*C/D-E
WRITE (6, 50)X
```

Function key: A key that tells the computer to perform a special function. These functions are defined by the programmer. The Model 100 has eight function keys.

Graphics: Pictures, line drawings, and special characters that can be displayed on the screen or produced by a printer.

Hard copy: A copy of the computer's output printed on paper.

Hard disk: A mass storage device that uses a rotating rigid disk made of a hard plastic-like material. It has many times the storage capacity of a diskette.

Hardware: The various physical components of a computer system, such as the computer itself, the printer, keyboard and monitor.

High-level language: A computer language that uses simple En-

glish words to represent computer commands. For instance, the command PRINT "Hello" in BASIC tells the computer to print the word *Hello* on the screen.

Initialize: To set a program element or hardware device to an initial quantity (usually zero).

Input: To transfer data from the keyboard or a mass storage device into the computer's internal memory.

Input device: A device used to enter information into a computer. These are all input devices: keyboard, joystick, disk drive, cassette player.

Input-Output: The processing of entering data into a computer or taking it out.

Integrated circuit: A group of components that form a complete miniaturized electronic circuit. The circuit has a number of transistors plus associated circuits. These components are fabricated together on a single piece of semiconductor material.

Interactive: A computer system that responds immediately to user input.

Interface: A device that allows other devices to communicate with each other; a modem, for instance.

Inverse video: A process that shows dark text on a light background on your screen. Normally light text is shown on a dark background.

I/O: Input/Output

Jack: A plug socket on a computer.

Joystick controller: A 2-inch by 2-inch black box with a movable plastic stick on the top of it. It is used as an input device most often with computer games.

K: When used as a measure of computer memory K is an abbreviation for kilobyte or kilobytes. It is also an abbreviation for kilo.

Kilo: A prefix meaning 1000. In computer jargon it is used as an abbreviation for 1024

Kilobyte: 1024 bytes. Thus 4 kilobytes (abbreviated 4K) of memory is about 4000 bytes of memory. It is exactly 4096 bytes, but 4K is a convenient way to keep track of it. This means that if you have 4K of memory, you have space for 4096 characters, spaces, numbers and symbols in your computer.

Language: The means of communicating. The difference between computer language and human language is that a computer language allows humans to communicate with computers.

The lowest level of language is machine language; the *pure* language of the computer. Machine language programs use 1's and and 0's to represent the off's and on's in the computer. Machine language programs are the most difficult programs to write but they do not have the speed and action limitations of higher level languages. Assembly language programs are also low level languages but they use simple mnemonic statements as commands. High-level languages such as BASIC, FORTRAN and Logo, use English-like statements to tell the computer what to do. BASIC is the most common language because it is the simplest to use.

Load: The process of entering data or programs from an external device, such as a disk drive, into the computer. For instance, if you *load* a program into the computer it is available for use.

Line number: A number that defines each line of programming in a high-level language. Each line of the program begins with a line number. The computer executes the program in line number order starting with the lowest number.

Logic: A systematized interconnection of devices in a computer circuit that cause it to perform certain functions.

Logical operator: A symbol that tells the computer to make a comparison. These operators include > (greater than), < (less than), and = (equals).

Logo: A high-level computer language that is often used by children. An easy to learn language, Logo, allows colorful, detailed graphics to be drawn on the screen. Sprite graphics and turtle graphics are terms assoicated with Logo.

Loop: A series of programming instructions that repeat. The last instruction in the loop tells the computer to return to the first instruction. Intentional loops have some means of escape built into them. Unintentional loops, caused by programmer error, can only be stopped by pressing the escape key or turning the computer off.

Low-level language: A computer language at the machine level (a pattern of pure binary coding.) It is neither simple nor obvious for a human being to read, understand or use.

Machine language: The lowest-level language. It is a pattern of ones and zeros that the computer understands.

Mail merging: A program usually used with word processing that allows you to insert names and addresses into a group of documents. All you have to do is load the names and a

sample of the document; everything else is automatic. For instance, suppose you want to send the same letter to 2000 people. Once you have created the mail list and the letter, the computer adds the name and address of the first person to an original copy of the letter. It can also address the person by name at several different places in the letter. It does the same thing for the second person on the list, the third, and so on.

Mainframe computer: A large expensive computer generally used for data processing in large corporations and government installations. Originally, the term referred to the extensive array of large rack and panel cabinets that held thousands of vacuum tubes in the early computers.

Mass storage: The files of computer data that are stored on media other that the computer's memory. For example, diskettes and cassettes are mass storage devices.

Matrix printer: Dot matrix printer

Mega: A prefix meaning one million.

Memory: The internal hardware in the computer that stores information for further use.

Menu: A display shown on the screen that gives you a list of options. You select an option by typing a letter or number and pressing the return key.

Microcomputer: A fully operational computer that uses a microprocessor as its CPU. Microcomputers are a new kind of computer. Whereas minicomputers are small scale versions of large computers, microcomputers are an outgrowth of semiconductor technology. Consequently, some microcomputers have features not found on either minicomputers or mainframe computers.

Microprocessor: A central processing unit contained on a single silicon chip.

Minidisk: Diskette

Minicomputer: A small computer based on large computer technology.

Mnemonic: A technique or symbol designed to aid the human memory. Its most common computer use is in assembly language programming. For instance, it is much easier to remember LDA (an assembly language term) than 004000072.

Mnemonic code: A system of abbreviations designed to replace

obscure, complex terms used in preparing assembly language programs.

Modeling: A partial simulation of real or possible situations.

Modem: A modulating and demodulating device that enables computers to communicate over telephone lines.

Monitor: A television or cathode ray tube used to display computer information. In common usage, a monitor usually refers to a special device used exclusively for computer output. It can display a line 80 characters long and has at least 24 lines of text.

Mylar: A type of plastic used in the manufacture of floppy disks.

Nano: One billionth

Nanosecond: One billionth of a second. Modern computers operate in nanoseconds.

Numeric data: Data that consists entirely of numbers.

Operating system: A set of computer programs devoted to the operation of the computer itself. The operating system must be present in the computer before applications programs can be loaded or run.

OS: Operating system.

Output: Information or data transferred from the internal memory of the computer to some external device.

Output device: A device used to take information out of a computer. CRTs, mass storage devices (such as disk drives), and printers are all output devices.

Packaged software: Canned software.

Parallel: The performance of two or more operations or functions simultaneously. For instance, a parallel port accepts all eight bits of a byte at one time. Some printers are connected to the computer via the parallel port.

Pascal: A powerful high-level computer language for business and general use. Named for French mathematician and philosopher Blaise Pascal (1623–1662). Here are three lines from a Pascal program:

```
BEGIN
READLN (I,HOURS)
IF I=1 THEN WORK:=SUN
```

PC: Personal computer.

Peripheral: Any device that connects to a computer. Printers, joysticks and modems are peripherals.

Personal computer: Microcomputer.

PILOT: This is an easy-to-learn, high-level language designed for

novice computer users. Primarily used for educational programs.

Pixel: A picture element that is one point on a screen. The size of the pixel depends on the computer graphics mode being used and the resolution capabilities of the screen.

Port: The location where Input/Output devices are connected to the computer. For example, a printer may be connected to computer with a cable at the parallel port. A modem may be connected at the serial port.

Power supply: A device, consisting of a transformer and other components, that converts household current (115 or 230 volt) to the voltage used by a computer.

Printer: A device for producing paper copies (hard copy) of the data output by a computer.

Program: An organized group of instructions that tells the computer what to do. The program must be in a language the computer understands.

Prompt: A symbol, usually a question mark, appearing on the screen that asks you to enter information.

QWERTY: An abbreviation used to indicate a standard typewriter-style keyboard. The first six letters in the third row of a standard keyboard are QWERTY.

RAM: Random Access Memory.

Random Access Memory: This is the read-write memory available for use in the computer. Through random access the computer can retrieve or send information instantly at any memory address. See memory.

Read: The act of taking data from a storage device, such as a diskette, and putting it in the computer's memory.

Read Only Memory: A random access memory device that contains permanently stored information. The contents of this memory are set during manufacture. A game cartridge is a Read Only Memory.

Read/Write memory: Computer memory that you can put data into or take data out of at any time.

Record: An organized block of data. For instance, the payroll information on one person.

Resolution: The number of points (or pixels) you can put on a television screen (or monitor) both vertically and horizontally. High resolution indicates a large number of pixels and, therefore, a sharper display.

Reverse video: Inverse video.

ROM: Read Only Memory.

SAVE: A command that tells the computer to store the contents of memory on some media, such as a diskette or cassette.

Screen: A CRT or television screen.

Semiconductor: A metal or other material (silicon, for example) with properties between those of conductors and insulators. Its electrical resistance can be changed by electricity, light, or heat.

Serial: A group of events that happen one at a time in sequence. For instance, a serial interface reads in a byte one bit at a time. Modems transmit data serially.

Silicon: A nonmetallic chemical element resembling carbon. It is used in the manufacture of transistors, solar cells, etc.

Software: The programs and data used to control a computer. Software is available in many forms. You can type the program in yourself or you can have it transmitted to you over the telephone. You can also get it on cassette, diskette, or cartridge.

System: All of the various hardware components that make the computer usable, such as the computer, printer, modem, keyboard, CRT, and disk drive or cassette player.

Text editor: A computer program that allows you to change or modify the contents of memory. It can modify either data or programs.

Turtle graphics: A small, triangular shape that is displayed on the screen when the language Logo is used. The *turtle* shows the direction of lines for graphics. For example, if the instruction is to move north, then the turtle moves towards the top of the screen.

User-friendly: A computer system or software package that is easy for novice users to use and understand.

User's manual: A book or notebook that describes how to use a particular piece of equipment or software.

Variable: A quantity that can assume any of a given set of values. For instance, assume A is a variable whose value is 1. If you add 3 to it, its value becomes 4.

Video display: The screen of your monitor or TV.

Volatile memory: As used with computers, volatile means that the memory loses its contents when the computer is turned off. That is, any information in volatile memory is lost when the computer is turned off.

Window: A portion of the CRT display devoted to a specific purpose.

Word: A minimum storage element in computer memory and the smallest data element worked on by the CPU. Word sizes vary with the design of the computer, varying from 8 bits to 12, 16, 32 or 64 bits.

Word processing: A special feature of a computer that allows you to manipulate text. See also word processor or text editor.

Word processor: A computer program that helps you manipulate text. You can write a document, insert or change words, paragraphs or pages, and then print the document letter-perfect.

Write: To store data on external media such as a disk or cassette. The expression *write to diskette* means that the information stored in the computer's memory is sent to the diskette where it is stored.

Write protect: When new material is written to a diskette, any old material there is erased. Write protect is a method of fixing the disk so that it can't be written on.

Software Publishers

32 BASIC Programs for TRS-80 Computer
dilithium Press
8285 S.W. Nimbus
Suite 151
Beaverton, Oregon 97005
(800) 547-1842
(503) 646-2713

80 Micro
80 Pine St.
Peterborough, New Hampshire 03458
(603) 924-9471

Adventure International
P.O. Box 3435
Longwood, Florida 32750
(800) 327-7172

Avalon Hill
Dept C-10
4517 Harford Road
Baltimore, Maryland 21214
(800) 638-9292

BT Enterprises
10 Care Bough Road
Bohemia, New York 11716
(800) 645-1165

Computer in the School: Tutor, Tool, Tutee, The
Columbia University Press
562 W. 113th St.
New York, New York 10025
(212) 316-7100

Computers in the Schools
Haworth Press
28 E. 22nd St.
New York, New York 10010
(212) 228-2800

Computing Teacher, The
Computing Center
Eastern Oregon State College
La Grande, Oregon 97850
(503) 963-1582

Educational Computer Magazine
P.O. Box 535
Cupertino, California 95015
(408) 252-3224

Epyx
1043 Kiel Court
Sunnyvale, California 94089
(408) 745-0700

Instant Software
Elm St.
Peterborough, New Hampshire 03458
(603) 924-9471

Interface Age
McPheters, Wolfe, & Jones
16704 Marguardt Ave.
Cerritos, California 98701
(213) 926-9540

Iota Systems
1690 Day Valley Road
Aptos, California 95003
(408) 684-0482

Louis, E.J.
P.O. Box 268 Powell Road
Holland Patent, New York 13354
(315) 865-4927

Micro Computer Services
1637 N. Jantzen
Portland, Oregon 97217
(503) 285-7424

Nelson Software Systems
9072 Lindale Avenue South
Bloomington, Minnesota 55419
(612) 881-2777

Padware Limited
P.O. Box 14856
Chicago, Illinois 60614
(312) 248-5004

PCM Portable Computer Magazine
FALSOFT, Inc.
9529 U.S. Hwy. 42
P.O. Box 209
Prospect, Kentucky 40059
(502) 228-4492

Portable 100
New England Publications, Inc.
Highland Mill
Camden, Maine 04843
(207) 236-9621

Portable Computer Support Group
11035 Harry Hines Boulevard, No. 207
Dallas, Texas 75229
(214) 351-0564

Prickly Pear Software
9234 E. 30th St.
Tucson, Arizona 85710
(602) 886-1505

Screen Play Software
P.O. Box 3558
Chapel Hill, North Carolina
27514
(800) 334-5470

Skyline Software
4510 W. Irving Park Rd.
Chicago, IL 60641
(312) 286-0762

Traveling Software
11050 5th Ave. N.E.
Seattle, Washington 98125
(206) 367-8090

Index

THINGS TO DO WITH YOUR TRS-80® MODEL 100 COMPUTER

Are you trying to decide whether the TRS-80 Model 100 is the right personal computer for you? Or have you already started to explore the exciting world of microcomputing the TRS-80 Model 100 opens to you? Whatever your needs and interests—entertainment, education, business—whatever your questions, you'll find them answered in this expert yet easy-to-understand-and-use guide to currently available hardware and software for the TRS-80 Model 100. Here is all the information you want—as well as up-to-date prices and ratings—on:

- Telecommunications and networking
- Word processing
- Communicating between the Model 100 and the TRS-80 Model 4
- The Model 100's built-in software
- Home finances and record keeping
- Programming and computer languages
- Accessories you can buy
- And much, much more

This book was written with the TRS-80 Model 100 in mind, but much of the information contained here is also applicable to the NEC PC-8200.

Be sure to look for **COMPUTERS FOR EVERYBODY; BITS, BYTES & BUZZWORDS: UNDERSTANDING SMALL BUSINESS COMPUTERS**; and the other books in the Signet dilithium **THINGS TO DO WITH YOUR COMPUTER** series.

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